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AND ABSTRACT OF THE LITERATURE

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THE CAMPAIGN AGAINST MINERS' NYSTAGMUS IN THE COLLIERY DISTRICT OF LIEGE, BELGIUM*

N. STASSEN, M.D.

Medical Officer to the Liège Collieries

IN 1906, in spite of numerous works published on the subject, our actual knowledge of the etiology and pathogenesis of miners' nystagmus was still very confused. In this same year, when giving evidence before a commission of inquiry, instituted by the Belgian government to investigate the conditions of work in mines, certain doctors went so far as to deny the industrial origin of the disease. In accordance, therefore, with an agreed policy, the Commission on Industrial Diseases for the province of Liège resolved to obtain the views of all the ophthalmic surgeons in Liège, of mining engineers, and of colliery doctors on the cause and extent of the malady. The results were, unfortunately, disappointing, so that on the advice of M. Liebert, then chief engineer of the Liège mines, I was deputed to make an extended inquiry among the collieries of the district with the object of ascertaining the frequency of nystagmus and ultimately of deciding its causation.

In carrying out this obligation, I received full authority and willing assistance from all the managing directors of the collieries and metalliferous mines in the Liège basin, and was thus enabled to examine: (1) the personnel of one iron mine; (2) the personnel of one zinc mine; (3) the personnel of one coal mine where naked lights (candles and lamps) are used; (4) the personnel of nineteen coal mines where oil and benzine safety lamps are used; and (5) the men on day shifts at six coal mines where the majority of the miners have used portable electric lamps for at least three years. As coming within the scope of my instructions, I likewise made an examination of the personnel of several slate quarries. The total number of miners examined was over 20,000, of whom over 8,000 were seen twice during one day—*viz.*, just before going down into the mine, and immediately on coming up after finishing the day's work.

In the course of the numerous descents into the mines which I had occasion to make, I followed the miner step by step from his entering the cage up to his commencing work; I familiarized myself with

* An address read at the Congress of the Royal Institute of Public Health held in Brussels, May, 1920, and translated for publication in the Journal of Industrial Hygiene with the consent of Dr. Stassen and the Royal Institute. Received for publication Sept. 28, 1920.

the way in which he manipulated his tools; I kept him under observation up to the moment when, his day's work being over, he returned to the surface. As the result of my experiences I have arrived at the conviction (confirmed by the great majority of English oculists who have specially studied the question, notably, our distinguished colleague, Dr. Lister Llewellyn) that the real cause of nystagmus must be sought, not in the upward look which the miner is compelled to adopt at his work, but solely in the faulty conditions of lighting at the bottom of the mine.

The conclusion arrived at, as the direct result of the inquiry, was that there exists among miners, working under faulty conditions of lighting, a fatigue of the visual apparatus which is ultimately transformed into a nervous syndrome, characterized by inco-ordination and exaggeration of ocular reflexes, and that occupational nystagmus, previously considered to be a well-defined morbid entity, is, in reality, only a pathognomonic symptom of overstrain of the centers controlling the muscular equilibrium of the eyes.

The inquiry proved that, of the 20,000 miners examined, 5,000 (25 per cent.) exhibited, in various degrees, definite signs of ocular fatigue (hemeralopia, defective retinal receptivity, nystagmus, blepharospasm). These 5,000 colliers with "visual fatigue" may be divided into five groups:

1. In 8 per cent. the ocular fatigue was temporary, the symptoms disappearing after twelve hours' rest;

2. In $12\frac{1}{2}$ per cent. the ocular fatigue was slight;

3. In 3 per cent. the ocular fatigue was pronounced;

4. In 1 per cent. there was distinct ocular strain with an appreciable amount of diminishing occupational capacity;

5. Finally, 2 per thousand were found afflicted with a definite neurosis and psychic troubles, which incapacitated them from all work or at least from all work down the mine.

From the point of view of prophylaxis, it was proved (see Table 1) that attention must, above all, be directed to the better lighting of workings if we wish to combat effectually and to diminish the ill effects of visual overstrain in miners. The campaign against this occupational disease must, therefore, be carried on with two definite objectives: (*a*) to seek out the preventive measures which will render miners immune to attacks; and (*b*) to treat workers affected with occupational visual troubles.

Preventive Measures

We have seen that defective lighting of underground workings constitutes the necessary and sufficient cause of visual troubles among miners, and, reciprocally, that improvement in lighting arrangements has brought about a disappearance of these effects among workers in metalliferous mines. It is, consequently, upon improved lighting conditions in the workings that measures for the prevention of visual troubles among all miners must primarily be based. Though this improvement has been effected in metalliferous mines, the difficulties of working and the presence of inflammable gas, particularly fire damp, have, unfortunately, rendered similar results in coal mines less easy of attainment. The lighting of coal mines with naked lights is, as a matter of fact, impossible. It is useless to recall here the amount of work and experience which has been devoted to attempts at reconciling increased lighting in coal mines with the measures necessary to protect colliers against explosions. Laws and decrees govern minutely the lighting of coal mines, and neither managers nor workers can, without incurring very severe penalties, set aside these important safety statutes.

The question may be asked, however, whether there is not some way to be found,

in the actual method of lighting by safety lamps, whereby the light can be so improved physiologically as to do away with the evils which now ensue. Is it possible to augment the lighting power of the safety lamp and at the same time to give the light sufficient steadiness to provide a color agreeable to the eye, and to protect the sight from glare and flickering?

TABLE 1. — INFLUENCE ON NYSTAGMUS OF DIFFERENT VARIETIES OF SAFETY LAMPS

Method of Lighting	Illuminating Power Heffner Unit	Illuminating Power at End of Day's Work	Steadiness of Light	Color of Light	Discomfort from Glare	Severe Cases of Nystagmus per 10,000 Workers	Marked Cases of Nystagmus per 1,000 Workers	Percentage of Cases of Nystagmus among Workers on Regular Daily Shifts	Frequency of Nystagmus among Workers Using One Method of Lighting Exclusively during Occupational Career
Oil safety lamp	0.50	0.28	Flickering; affected by air currents and humidity	Reddish-yellow	Considerable, particularly at end of day	35	57	31	Very numerous
Benzine safety lamp	1.01	0.80	Flame fairly steady; flickering caused by draught	Yellowish	Considerable, particularly at end of day	12	44	21	Less numerous than among workers using oil safety lamps
Candles and lamps with naked lights	0.70	0.70	Flame affected by moving air and humidity	Yellowish	Noticeable when miner does not fix candle overhead	0	13	28	A few cases
Electric lamps with accumulators	1.75–2.00	1.50–1.75	Steady	White	Appreciable, but less severe than with other methods	8	12	15.4	No cases encountered; period of inquiry too short — should be followed up
Acetylene lamps	8.00–15.00	8.00–15.00	Steady; scarcely affected	White; agreeable to eye	None, owing to reflector	0	0	0	No cases

From several of these points of view portable electric lamps have made some progress, but their lighting power is still poor. Moreover, making every allowance for faulty construction and upkeep, their equality with safety lamps is not altogether agreed upon. In comparison with oil or benzine safety lamps, portable electric lamps present the great disadvantage of not warning the miner of the presence of fire damp, and in several dangerous collieries employing electric lamps it has been absolutely necessary to provide the colliers with an additional oil or benzine safety lamp as a gas detector, thus increasing to a marked extent the cost of lighting.

Under any circumstances, however — and this applies equally to safety lamps — certain improvements must be effected in the lighting at the bottom of the mine, and without jeopardizing the safety of the workers. It is, therefore, essential to filter the light given out by the lamps, or at least to shade the eyes of the miner from the glare and flickering of the flame. On

many occasions I have had an opportunity to note the good effect exercised on the vision of coal getters and overseers by the interposition of a small screen of parchment paper between the casing and the glass of the lamp. It should be very easy to bring this method of protecting the eyes into general use, as it is quite sufficient for screen purposes to dull a portion of the glass only.

With portable electric lamps one could have recourse to subdued globes. During experiments undertaken in the Esperance Collieries at Montegnée, I have observed that the subdued diffuse light from these particular globes was most agreeable, better to work with, and much less fatiguing to the eyes.

As touching on the same subject, I mention here the researches which were made in 1911 and 1912 on the underground personnel of the Hasard Collieries. In 1911, following out the view that visual troubles must be due to the over-brilliant glare of the yellow flame projected too powerfully on the white glass of the lamp, M. Henry, technical director of the Hasard Collieries, supplied all the workers of the Fleron pit with safety lamps fitted with uranium glass of a greenish-yellow shade. The light given out by these lamps was more pleasant to the eye than that of ordinary safety lamps, and the glare from the flame was less troublesome. The workers kept very well during the use of these improved lamps. Unfortunately, however, the war came to interrupt these experiments, which should be resumed at the earliest possible moment.

Treatment of Visual Troubles among Miners

In order to be in a position to provide for pitmen, affected with visual troubles due to their occupation, the amount and kind of care demanded by their condition, there was founded, in 1908, in the Rue St. Gilles, Liège, a clinic for miners' nystagmus, which, though primarily intended for treatment, became very soon a medical service for study of the disease also.

On the suggestion of the Committee on Industrial Diseases, the Provincial Council decided to take up the matter of providing pecuniary assistance to workers attacked with nystagmus. By the establishment of grants in aid for helping the local sick clubs (which, thanks to a tacit understanding between themselves and the colliery proprietors, had organized special departments for miners' nystagmus), a system of equitable indemnity was established. When a collier is obliged to give up work on account of nystagmus, the colliery company by which he is employed, or the sick club with which he is affiliated, pays him in the ordinary course a special sick allowance. In addition, a standing committee in Liège, thanks to the substantial grants placed at its disposal by the Provincial Council, supplements this allowance by an amount calculated on previous wages, family upkeep, etc. When incapacity ceases to be total, or if, on a medical certificate, the worker is declared incapable of resuming his former work, the province makes a fresh grant to cover the period of his partial disablement.

Finally, with a view to co-ordinating the efforts directed against miners' nystagmus, to seeking out the cause, and to securing for those affected the necessary medical attention, the province of Liège has organized a medical service to study the physiological conditions of miners' work and the biological troubles engendered thereby. This provincial service acts as a uniting element between the management and the workers. It makes a point of securing for the latter the provision of employment most suitable to the actual ocular conditions; on the other hand, it demonstrates to the management the proper hygienic

modes of diminishing insanitary conditions underground. Thus, by securing suitable employment for the workers and by improving sanitary conditions in the mines, the service endeavors to fulfil the mission entrusted to its care: "To improve the health and well-being of the courageous workers in Liège mines."

From 1908 to 1920 over 500 patients attended the miners' nystagmus clinic. They were not all incapable of work; indeed, many had their occupational capacity unaffected. On the other hand, it was not uncommon to find, stranded at the clinic, unfortunate workers who had succumbed to amblyopia and neurosis resulting from that nervous exhaustion which is an inevitable effect of the cumulative fatigue which severe cases of nystagmus impose upon the worker's nervous system through his efforts to finish the day's work in some fashion. It is to these industrial wrecks that the clinic has been most helpful, for, after many months of treatment, it has restored their health and frequently their full working capacity.

TETRACHLORETHANE POISONING AND ITS PREVENTION*

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THE aim of this report is to define the initial symptomatology of tetrachlorethane poisoning, to point out the significance of the symptoms, and to discuss the best preventive measures to be adopted.

Tetrachlorethane (acetylene tetrachloride), a saturated hydrocarbon of the methane group, is a heavy, colorless, oily liquid, with a boiling point of 147.2° C. and a specific gravity of 1.6208 at 4°/4°. It is non-inflammable and has a sickish sweet odor suggestive of chloroform. It is used as a solvent for certain types of cellulose esters, dammar, sandarac, copals, etc.

During the war this substance rose to its present point of interest because of its use in some of the so-called aeroplane "dopes," or varnish with which aeroplane wings are painted. In this country it is being utilized for peace-time and commercial purposes in the manufacture of such articles as non-inflammable films, various lacquered goods, artificial silk, etc. Cellulose acetate is often used as a base and tetrachlorethane as the solvent. This country profited by the mistakes of the British and the Germans, and was protected from fatal cases of poisoning during the war chiefly through the use of good substitute solvents. In addition to the information learned from its war-time use, the increased care in its use in peace times has made tetrachlorethane an entirely feasible material with which to work. The somewhat meagre literature concerning its war-time use is made up essentially of reports from Jungfer (1), Grim, Heffter and Joachimoglu (2), and Koelsch (3) in Germany, Willcox (4) (5) (6) (7) in England, and Hamilton (8) (9) (10) in this country. From these sources we are able, however, to obtain an accurate idea of the symptomatology and pathology of severe poisoning from this substance.

The symptoms of poisoning are of two types, gastric and nervous. They are not usually combined but nervous symptoms may be preceded by gastric disturbances. The literature sets forth a typical case as beginning with general malaise, drowsiness at work, especially at night, loss of appetite, nausea, vomiting, morning retching, bad taste, constipation and headache. After a period of days or even weeks, there is jaundice with pale stools and bile-stained urine. Vomiting becomes worse. There may be confusion, stupor, delirium, coma, and death. Other not uncommon late symptoms may be petechiae, hematemesis, convulsions, and anuria. The clinical features particularly noted are the insidious onset, long duration of the acute stage, with intense jaundice — features which are important in the differential diagnosis from acute yellow atrophy, infectious jaundice, arsenic or delayed chloroform poisoning.

In discussing the pathology of tetrachlorethane poisoning, Willcox ascribes the jaundice to a cholangeitis set up in the smaller bile-ducts causing an obstruction to the flow of bile to the liver. There is present also a marked fatty degeneration of the liver cells which, in severe cases, is followed by necrosis of the liver cells and symptoms of autointoxication identical with those of acute yellow atrophy. If the patient survives the necrosis, then the affected area is replaced by fibrous tissue.

The observations to be here reported are on the general clinical aspects of tetrachlorethane poisoning in a plant making

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artificial silk — a plant well adapted as to management, personnel, and control of the poisoning to illustrate the possibilities open for the use of tetrachlorethane in peace time. Special investigation of the blood of the workers in this plant has been made by Dr. G. R. Minot and Dr. L. Smith and is shortly to be reported. Ninety-five people were employed at various times over a period of five months, twenty of whom were women engaged entirely in the spooling of silk.

Of the six processes involved in the making of artificial silk there are only two — so closely related as to constitute one — which need concern us here. This procedure, that of spinning out the thread on spools and drying it, was found to promote the greatest exposure to tetrachlorethane, and, as a result, all except three of the more severe cases of poisoning were among persons engaged in this work. The process involved twelve men working in eight-hour shifts of four men each, and about six men working during the day in and near the same room. Observation for cases of poisoning occurred over a period of five months. During this time twenty-one cases of poisoning occurred, nine of which were of a degree that demanded temporary suspension of work. The other twelve were of a sufficiently mild degree to permit continuance of work, and after a time the symptoms disappeared. No fatalities occurred. In fact, nothing more serious in the way of poisoning was observed than that degree which warranted the doctor keeping the men from work from six to eight weeks. The two severer cases were not really serious, nor have they resulted in permanent damage, as the men are at the present time in very good health. It is well to note here that keeping men from work was a therapeutic and precautionary measure employed by the doctor in charge. Not one of the men was confined to his bed at any time; all were up and about and, in most cases, out of doors in the fresh air, which was markedly beneficial.

Symptomatology

The symptomatology of tetrachlorethane poisoning is the first and most important question for consideration. To give a clear idea of the successive stages of poisoning in the usual order of occurrence, an endeavor will be made to group the symptoms, pointing out the important ones, and in this way to present a composite picture of the typical cases. It may readily be understood that the earlier symptoms in such a picture often appear in an individual who is on the verge of mild infection or who is physically below normal. A description of these very early symptoms may seem like an attempt to divide what is often referred to as general malaise into its component parts. Nevertheless, for this very reason, these slight symptoms considered in detail are, from the point of view of prevention, the most important in the whole picture. In most cases exposed to tetrachlorethane in this work they are sufficient to give a diagnosis of incipient poisoning—a point which should be particularly stressed, since these early and vague general symptoms are merely alluded to in the literature. Going further than these first general symptoms we find the symptomatology as a whole falling roughly into three groups — general, nervous, and gastric symptoms — as shown in Table 1. In many cases, the gastric symptoms overlapped the nervous symptoms.

The general, or what might be called preliminary symptoms, alluded to as being of so much importance, consist in an abnormal sense of fatigue and a general discontent which passes as a continual "grouch" among the patient's friends. Associated with this is an inability to concentrate. A man will say that he cannot keep still, and that five minutes is long

enough to be doing any one thing. Profuse sweating on any exertion accompanies a feeling of being easily tired. Occasionally some nocturia or a slight polyuria is complained of by those who have never before been so affected. While belonging more specifically to the definite nervous and gastric groups of symptoms, complaints of distaste for food and a feeling of nervousness frequently occur along with the first

ing necessitating cessation of work, and, in any event, precludes efficient prevention of the poisoning — a subject which will be taken up later.

Consideration of the nine more severe cases in detail shows that the general irritability and discontent appeared in all of the severe just as it did in the twelve mild cases. The sense of being easily fatigued occurred in eight out of the nine,

TABLE 1. — INCIDENCE OF SYMPTOMS IN TETRACHLORETHANE POISONING

Number of Case	General Symptoms						Nervous Symptoms					Gastric Symptoms											Length of Exposure in Months	Severity of Case
	Easily Tired	Sweating Easily	General Discontent	Inability to Concentrate	Nocturia	Polyuria	Dreaming	Headache	Vertigo	Nervousness	Insomnia	Loss of Appetite	Constipation	Diarrhea	Gas in Stomach	Epigastric	General Abdominal Pain	Pain in Lower Abdomen	Pain in Right Upper Quadrant	Eructations of Gas	Nausea	Vomiting		
1	+	+	+	+			+ +			+ +	+	+ +	+		+	+	+					+	2	Mild
2	+		+	+	+	+	+	+	+	+	+	+	+	+	+ + +	+		+		+ +	+	+	3	Severe
3	+ +		+	+			+			+	+	+	+								+		5	Mild
4	+	+	+	+				+		+	+		+		+					+	+		7	Mild
5	+	+	+	+			+			+	+	+	+		+ +	+	+			+			4	Mild
6	+		+				+	+		+		+	+								+		6	Mild
7			+	+			+ +			+	+	+	+		+	+	+						2	Mild
8	+		+					+	+ +	+	+	+	+			+ +	+	+ +	+ +	+	+ +	+ +	5	Severe
9	+		+					+		+	+	+	+ +		+	+				+		+	4.5	Mild

vague general symptoms. Although the twelve cases, to which reference has been made, showed symptoms of an exceedingly slight nature, they were closely observed because of the importance of such symptoms. Since the men continued at work and the symptoms after a short time subsided, the cases are not included in the accompanying table. It is important, however, to emphasize the fact that the failure to understand the significance of these very slight symptoms may easily lead the observer to overlook early cases. Such an oversight may lead to a more severe poison-

and the inability to concentrate in six. Profuse perspiration as a symptom was marked in three cases, while nocturia and polyuria occurred in only one case each. Nocturia consisted in nightly micturition two or three times over a period of a week, and polyuria was noticed over a period of three or four days with micturition eight to ten times daily. With the exception of this nocturia and polyuria, any further description of the symptoms is unnecessary except to reiterate that, taken as a whole, these symptoms constitute a picture very similar to the general malaise already mentioned,

and for this reason may easily be overlooked and their importance not realized. These apparently simple complaints, together with the blood picture to be referred to later in the problem of prevention, are of primary importance although they are but briefly mentioned in most of the literature.

Perhaps next in importance are the nervous symptoms which, as a group, tend to appear somewhat later in the course of the poisoning than do the general symptoms described. They are complained of in detail as headache, weird dreams, loss of sleep, and a general feeling of nervousness which is noticed by friends as well as by the person suffering from the poisoning. These symptoms are the more intense manifestations of the initial symptoms and constitute, therefore, this separate and later group. General nervousness in the subjective sense and the excessive dreaming are often among the earliest signs noted. The actual loss of sleep comes somewhat later, and with still severer poisoning there is often exhaustion on slight exertion, or more especially vertigo on stooping or leaning forward from a sitting posture.

In analyzing the cases according to the group of nervous symptoms, we find, as shown in Table 1, that general nervousness appeared in nine cases, accompanied by varying degrees of insomnia in eight. Dreaming was noted in six instances and headache in five, while actual vertigo under the above-mentioned circumstances occurred in only two cases. These, it seems well to add, were the most advanced cases.

According to the literature, the third group of symptoms — namely, the gastric — precedes the nervous group. This is probably because in the more advanced cases considered the gastric symptoms were more prominent and had at the time of examination overshadowed the nervous symptoms which began early. Contrary to the impression obtained from some of the literature, it seemed to me that in general the nervous and gastric symptoms occurred together, somewhat in the relation described previously. The gastric symptoms represented the most advanced stage and constituted the most severe manifestations of poisoning which I observed, the cases in which they occurred being ones of clear-cut toxic jaundice. This again is in contrast to the literature in which the gastric symptoms constitute the mildest type of poisoning.

An analysis of the nine cases described in Table 1 shows that a loss of appetite occurred in eight, accompanied by a feeling of nausea — constant, except at night, in five. In six there was a sensation of fullness in the stomach; in five, gas with frequent eructations. The gas and eructations were nearly always much more distressing after the ingestion of any food, as was also abdominal pain, when present. In this group of cases an occasional diarrhea, six to eight times a day, was complained of, but more frequently the complaint was of constipation. Finally, in the two more advanced cases, there was vomiting and sometimes associated with it generalized abdominal pain. Vomiting occurred only twice in two cases, and in two others about once a day for two or three days. The generalized abdominal pain was noted in four cases. With greater poisoning this pain was localized in the lower abdomen as seen in two cases, while in one case it was localized in the right upper quadrant.

In summarizing, then, the typical case seems most likely to begin with general symptoms of abnormal fatigue, discontent, and the like, with general nervousness and loss of appetite. As the poisoning progresses, these symptoms are accompanied by nausea and, finally, vomiting with distressing abdominal pain and dizziness on stooping. The only exceptions encountered were two instances in which the onset was sudden with vomiting in the morning while

at work. Such symptoms were no more severe than the stage represented by nausea. In both cases the men became suddenly unable to work. Whether these were instances of a rare skipping of the preliminary symptoms or whether these men had kept something back when questioned for symptoms is unknown.

The duration of symptoms was primarily a question of the length of time a man remained at work after developing any suspicious signs. Sometimes he was allowed to remain to make sure that his symptoms were not due to the onset of some mild infection. At other times he was allowed to remain to see if his symptoms would grow more severe, or if they might not cease altogether. This was the situation with the twelve men whose symptoms were of so mild a nature that excuse from work was not deemed necessary. They improved and signs of slight poisoning disappeared after two or three days.

In mild cases with no progress of symptoms beyond the stage of loss of appetite and slight nausea, four to seven days' rest from work led to a cessation of symptoms, and in ten days to two weeks the men were back at work in good health again. None of these rests from work involved more than normal living at home with slightly less exercise than usual. Symptoms as severe as vomiting persisted for three or four days after stopping work; the symptoms then reverted to the general ones, which lasted for a week or two. In a month's time, the two patients who had developed severe symptoms were, by the doctor's advice, back at work. It is, therefore, clearly shown that cessation of work, and with it cessation of exposure, is the primary requisite for recovery. In general, the earlier the detection of poisoning the shorter is the duration of symptoms, and the smaller is the chance of a recurrence.

Symptoms of the severity observed in the nine cases reported in Table 1 had associated with them very few physical signs, from which it appears that the stage of poisoning associated with physical signs is much more advanced than any encountered in the silk plant under observation. This serves to emphasize anew the fact that the cases of poisoning which I have observed were much earlier and milder than those noted in the literature where physical signs were regarded as being of great importance. In the early stages — all except two of my cases are included in this period — the signs were few, consisting chiefly of a loss of weight and a very slight jaundice. The loss of weight varied from 5 to 15 pounds over a period of time from two weeks to two months and usually preceded the appearance of jaundice. The jaundice at this early stage is not of the severity commonly indicated by the term jaundice. It is not sufficiently severe to cause bile to appear in the urine, and is generally noted only as a very slight yellow tint in the sclerae. It may or may not appear with the early general symptoms. It usually does appear, however, shortly before the gastric symptoms, and with close observation may sometimes be detected when the patient complains only of nervousness, with the loss of appetite and of sleep. With the onset of the more severe symptoms the jaundice may extend to the skin of the face and chest. Yet even in such instances bile did not appear in the urine. This jaundice is significant in that it gives a rough estimate of the amount of liver involvement.

In the analysis of the nine severer cases a very slight jaundice appeared in all except two. In the twelve milder cases in which the patients did not have to stop work, slight degrees of jaundice appeared in all except one. The natural inference from these exceptions is that the poisoning developed too rapidly for the jaundice to appear in the initial stages. It is well to emphasize here that under ordinary circumstances this jaundice of the sclerae

might easily pass unnoticed, as in these cases only a very slight yellow tint was noted. It is, nevertheless, to be considered significant. Associated with the severer symptoms of abdominal pain, etc., there is also a general abdominal tenderness and occasionally, on examination, the liver may be found enlarged. In only one case, however, was the liver found definitely enlarged. This case showed also markedly localized tenderness. From these signs it may, therefore, be concluded that jaundice and loss of weight are the earlier physical indications of poisoning.

This conclusion contrasts especially with the literature in which much stress is laid upon liver enlargement and tenderness as frequently occurring physical signs. My own observations, in all cases but one, detected poisoning early enough so that no signs of this nature could be elicited. The lack of physical signs affords some proof of the ease of detection of poisoning prior to a severe stage. The physical signs are at best, however, evidence which is useful only when taken together with the symptoms and the blood findings, both of which are distinctly of much greater importance than are the physical signs. Proper observation and interpretation of the symptoms and blood findings together constitute the most effective means for prevention.

A laboratory finding which is of questionable value is the very dark and reddish urine coincident with the occurrence of the preliminary symptoms. On adding nitric acid, I detected a light violet ring at the junction of the two liquids. This would, of course, constitute a test for bile which, in turn, is indicative of the disturbance of liver function. It was, however, not sufficiently marked to be a definitely abnormal sign, but suggests the possibility of developing by further study a test in the urine of value in the detection of tetrachlorethane poisoning.

The laboratory finding of primary importance, second hardly to the importance of symptomatology, is the appearance of the blood. The blood picture in these cases, if the poisoning has reached the stage of detection by symptoms, is very striking. Its significance can perhaps be most comprehensively explained at this point by referring verbatim to the work of Minot and Smith. Their views on the importance of the blood picture and its interpretation in these cases are as follows:

"1. Blood examination is unquestionably of value in the prevention of tetrachlorethane poisoning, and in the diagnosis and prognosis of poisoning by this substance.

"2. None of the cases presenting clinical symptoms of tetrachlorethane poisoning (twenty-one in number) occurred without characteristic blood abnormalities, which may be observed before clinical symptoms develop.

"3. The blood abnormalities include: (*a*) a progressive increase of large mononuclear cells, often reaching 40 per cent.; (*b*) the appearance of many immature large mononuclears; (*c*) a slight elevation in the white count; (*d*) a progressive but slight anemia; (*e*) a slight increase in the number of platelets.

"4. A percentage of large mononuclear white cells above 12 is the first sign of a reaction to tetrachlorethane and is a signal for close observation of that person. All persons with such a picture do not necessarily develop clinical symptoms of poisoning.

"5. The presence of a considerable number of young mononuclears is to be looked upon as indicating a severer condition than a case with the same number of more mature large mononuclears.

"6. Practical utilization of blood examinations in connection with careful clinical observations has shown that these examinations are necessary for the regulation of the employment of workers and of the

assignment of work to men likely to be exposed to tetrachlorethane."

With these observations and the amount of emphasis laid upon the earlier stages of poisoning as shown by the symptoms and the blood findings, comes the question of the proper interpretation of such observations. Upon this interpretation, upon the efficiency of the engineering, and upon the watchfulness of the management depends the prevention of poisoning. In the particular plant in question, however, the intelligent and watchful supervision of the men by the management simplified considerably the medical side of the problem. The managing force had a clear idea of the symptomatology and saw to it that the men did also. It was found that direct and leading questions were necessary to elicit information and the utmost frankness was demanded of the employees in reporting immediately any abnormal feeling or sensation. This helped materially in locating very early the few cases which occurred. Some detail in this regard is included in the consideration of prevention. In interpretation of the data collected, it is important to consider the whole picture together rather than any one part alone, especially the blood or the symptoms. Of the interpretation of the blood picture sufficient has been said by Minot and Smith. In order to observe and interpret symptoms properly as a part of the whole picture, it is important to have medical supervision of a fairly exact sort.

The plan of general medical supervision would be somewhat as follows: On employment a routine physical examination should be made to determine a man's state of health, to observe his appearance, and to learn, if possible, his susceptibility to tetrachlorethane. This physical examination should include blood and urine examinations, the former, as stated by Minot and Smith, being valuable at this time to determine a man's normal cell count. By way of routine, the doctor should be able to see the employees two or three times a week and should question directly for any possible symptoms. The foremen should be acquainted with the preliminary symptoms and should report to the doctor for further questioning and observation any of their men showing these symptoms. A blood smear should then be taken and a careful watch kept of the patient's blood. Any man developing early symptoms lasting from two to three days should be excused from work for several days, during which time he should report to the doctor once or twice. The symptoms displayed, together with the length and severity of exposure, should be considered as a basis upon which to determine the length of time a man should remain away from work.

Prevention

Briefly, a person suffering from a mild case of tetrachlorethane poisoning, with loss of appetite and sleep, and with general nervousness for two or three days, should have his blood examined, and if that is abnormal he should be laid off for a time not exceeding a week. This should be done independent of the appearance of jaundice. On his return, he will probably be able safely to continue work at the plant. A still milder case with vague general symptoms and previous loss of weight should be watched carefully, but unless the blood picture suggests more severe poisoning than do the symptoms, work may safely be continued under observation.

In the case of more severe poisoning with abdominal pain in addition to the milder symptoms, the man should be excused from work immediately and should later have his blood examined. He will probably show jaundice. The time of return to work depends upon the progress of symptoms and upon medical observation—in the ordinary case, probably after two to three weeks'

absence. A case with sudden onset of vomiting accompanied by severe pain and much gas should be excused immediately. It is advisable for a person so affected to get other work if after his return there appears the slightest tendency to develop symptoms again. Undoubtedly, it would be better for him to give up this sort of work indefinitely, or to discontinue it for at least three or four months. At the end of that time, his possible return with exposure to tetrachlorethane can better be decided upon. Two mild attacks due to poisoning should lead the employer to get the man other work outside the plant. As a rule, any attack of poisoning of the severity last mentioned should prevent a man from returning to the same work.

These remarks will suffice to show the general method of interpreting symptoms, upon which prevention of the poisoning is, of course, primarily dependent. It is also dependent on our ability to discover and to eliminate the susceptible individual as well. This elimination of the susceptible makes the process of selection of employees important and consequently emphasizes perhaps more than usual the importance in industry of the preliminary physical and laboratory examinations.

In regard to susceptibility, observation has shown that the older man of perhaps 40 years or more does not resist exposure to tetrachlorethane as well as does the younger man of about 20 years. The only exceptions to this are cases of older men now employed who appear to have built up some form of resistance to the poison in the course of a long exposure. In addition to this, there is some reason to suppose that tetrachlorethane is absorbed through the skin. Some of the younger men of about 20 years with delicate skin have been thought more susceptible — a supposition which is, of course, somewhat hypothetical. With this in mind, however, care has been taken by the management of the silk plant under observation to have the men wash their hands in glycerine on leaving the plant and before meals. This has stopped some skin eruptions said to have existed before the present medical supervision was undertaken. What effect exposure has upon a man who has been poisoned once and who returns to work after employment elsewhere for five or six months, is not known. No chance to observe such a case has yet offered itself.

This outlines the main principles of prevention of tetrachlorethane poisoning from the point of view of interpretation of symptoms and laboratory findings as well as from the point of view of selection by the elimination of the susceptible. The personnel necessary for following these principles and the records used are still in the experimental stage, but it is hoped that they may be incorporated later in further observations on tetrachlorethane poisoning. They would, of course, necessarily vary with the enlargement of the plant.

The third item of importance under prevention is largely a matter of engineering, involving the proper enclosing and ventilating of hazardous processes. All possible care in this respect has been taken by the management at the silk plant investigated. Nevertheless, many things have had to be learned experimentally and much improvement in ventilation has been made in the last six months. In the more exposed processes in manufacture, powerful suction drafts pulling the air downward have been introduced. The spinning process has been almost entirely enclosed. The process of solution of the cellulose acetate has been put into a separate room and the men wear masks whenever working there. Masks are also worn by men working with acetic anhydride and prevent much discomfort although the substance is not particularly dangerous. It has been noticed during hot weather that heat renders the fumes of tetrachlorethane more diffusible and makes

the liquid itself more volatile. During hot weather, therefore, the men are doubtless more subject to the effects of exposure. Refrigeration of the spinning room, were such a thing possible, would, for that reason, be very desirable.

In general, then, prevention of tetrachlorethane poisoning, in so far as it presents an opportunity for engineering skill, is entirely a matter of enclosing as far as possible the various processes and, in addition, of using suction drafts as well as forced currents of air which will carry the tetrachlorethane (which is heavier than air) downward and out of a room rather than diffuse it as occurs in attempting removal by any other method.

Lastly, as a help in prevention, general measures are necessary, such as the regulation of working hours and adequate vacations, eating lunches away from contact with tetrachlorethane, the use of special clothes while at the plant, and, finally, any general sanitary supervision of drinking water, lavatories, and the like.

In conclusion it may be said that after having observed the action of tetrachlorethane in the making of artificial silk, I am quite convinced that cases of poisoning therefrom need not reach such a degree of severity as did the cases resulting from its war-time use mentioned in the literature. The poisoning can be detected very early. It seems fairly certain that a definite change, running parallel with, or perhaps preceding the symptoms, has been noted in the blood.

Proper engineering and intelligent management, then, seem sufficient or nearly sufficient for adequate medical control. Much has been done in the prevention and the confining of fumes from tetrachlorethane by methods generally covered in the term engineering. Perhaps more important, however, is intelligent management by men who understand and execute the necessary preventive measures. What may be accomplished through careful supervision has been shown in the silk plant under observation. Both the medical supervision and the mechanical preventive measures can doubtless be improved by further study and it seems reasonable to expect that cases of poisoning other than those of extreme mildness can be entirely prevented.

Summary

1. Symptoms of the very early stages of tetrachlorethane poisoning can be detected with careful observation. They are often not marked and consist of general gastric and nervous disturbances.

2. The proper interpretation of the early symptoms, together with a clear understanding of the importance of the blood findings, will make possible the prevention of all but the very slight cases of poisoning.

3. From these observations it seems justifiable to conclude that tetrachlorethane is an entirely feasible material with which to work commercially — in fact, no more difficult to use than benzol, trinitrotoluol, and lead.

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DISCUSSION OF PUBLIC HEALTH BULLETIN NO. 106, COMPARISON OF AN EIGHT-HOUR PLANT AND A TEN-HOUR PLANT

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The writer has been hesitant in considering the publication of the present discussion of Bulletin No. 106 of the United States Public Health Service because of his relation to the investigation. Regarding this, he may say that he was not directly connected with the portion of the field work which forms the basis of this report, and that the investigation covering the 8-hour plant was completed before he became a member of the Committee on Industrial Fatigue of the Council of National Defense. This committee has not met since the preparation of the report. His relations to industry, however, are such that he is impelled to interpret and evaluate from the standpoint of its practical applications not only the material in the report under consideration, but anything which may appear to have a bearing upon the selection, efficiency, upkeep, and welfare of the human being in industry. Since the question of the most efficient working day is one of the important problems in this connection, and one which forms the subject of his own research, he has no choice than to accept the conclusions arrived at in this report or to analyze the report and decide upon its merits on the basis of such an analysis.

The present article has been written entirely as a criticism of certain conclusions as based upon certain presented data. This is not to be taken as a document in favor of the 10-hour day as against the 8-hour day, or for or against any particular length of working day, but as an inquiry into the character and use of certain presented facts to determine whether or not they justify the conclusions drawn from them. The science of industrial physiology is a new science, and the chief work to be done in the beginning is the development of technic. By criticism, technic is perfected. If, therefore, this communication is to serve the writer's purpose, it will be a contribution to the technic of industrial physiology.

The conclusions reached in Public Health Bulletin No. 106, *Comparison of an Eight-Hour Plant and a Ten-Hour Plant*, are briefly summarized on page 26 as follows: "A comparison of the 8-hour and 10-hour systems leads to the conclusion that the 8-hour system is the more efficient." Evidence for this is found in the decline of the hourly output at the 10-hour plant, as compared with its steady maintenance at the 8-hour plant; the greater amount of lost time and the greater amount of artificial limitation of output at the 10-hour plant; and the higher accident risk due to fatigue which accompanies the decline of working capacity at the 10-hour plant.

No clear statement is made as to just what is meant by the word efficiency as it is used in the summary of conclusions. The character of the evidence leads one to suspect that it is used in a very narrow sense, while, on the other hand, the purpose of the investigation as stated in the introduction of the report suggests the broader and usual conception of the word efficiency. To quote from the introduction: "With the entrance of the United States into the war the old problems of industry and labor suddenly changed. Industrial working capacity ceased abruptly to be a private concern; production became a public interest of the first consequence. . . . To attain maximum production without prejudice to national vigor — this was the new and enlarging demand of the time. . . . Under such circumstances and with a view to contributing to the solution of these vexed problems of industry, an investigation into certain industrial conditions was begun in July, 1917, by the Federal Public Health Service. . . ."

In view of the fact that only two plants have been studied, the comparison will be limited by the writer to two plants rather than to two systems. In comparing the two plants with regard to the four points enumerated above, the simple study of a number of jobs in each shows lost time and stereotyping to be more prevalent in the 10-hour plant, but no evidence is presented to indicate whether these are sufficient to reduce the production to that which would be obtained under an 8-hour schedule. A complicated procedure has been adopted regarding the other two points. An hourly index of production for each plant as a whole has been

obtained. Since the two plants make a different product, this is achieved by a common classification of the occupations in each plant and a study of representative operations in each class, from which an average is obtained. The hourly record of accidents is also obtained, and this, with the hourly output indices, makes it possible to obtain hourly ratios of accidents to production.

Even if the hourly output indices and the hourly accident risk indices could be admitted, the writer would maintain that the report had not gone farther than to compare the various hours with a particular hour in the same plant. But many objections must be raised to the methods of obtaining these indices and to the interpretation of them, and the points in question will be presented under the following heads: (*a*) criticism of methods employed in determining output and accident risk indices; (1) classification of occupations, (2) representation within classes, and (3) accident risk in terms of production; (*b*) discussion of evidence presented as indicative of relation of length of working day to indices; (*c*) criticism of indices used as measures of efficiency.

Criticism of Methods Employed in Determining Output and Accident Risk Indices

Classification of Occupations. — The method employed to obtain the hourly output indices was, first, to classify the occupations into definite groups or types, and, second, to record the hourly output of representative jobs of each group. After having obtained the average hourly output for each job, hourly indices were derived by giving to the hour of maximum production a value of 100.0 and determining for each of the other hours their corresponding value according to the following formula: $\frac{\text{actual output for hour}}{\text{actual output for maximum hour}} \times 100$. Four types of work were formed common to both factories, each of which was given equal weight in obtaining the output indices for each factory. These groups were designated muscular work, dexterous work, miscellaneous machine work, and lathe machine work. Thus, after obtaining the hourly output indices for each group, the average for the four groups was obtained, giving the representative hourly output indices for each factory. The importance of inquiring into the method of classification and of representation within each class is at once obvious.

It must involve, first of all, an occupational census of each plant in order to determine the jobs and the number of workers engaged on each. Such a census was taken at the 10-hour plant, but the classification of occupations in the 8-hour plant was based upon one made by some one else in a similar industry located in another city (see page 73). This would hardly satisfy the reader that the jobs had been sufficiently studied to warrant classification and to permit of the selection of representative jobs. An automobile plant, as is well known, may sublet contracts for parts, and may do a greater or less amount of assembly before shipment.

The only explanation one obtains in attempting to find a justification for a classification, upon which the entire comparison of the two plants as regards output and accident risk depends, is the following assertion: "Following Florence's plan, the operations were classified under four main heads: dexterous handwork; muscular handwork; machine work on lathes; and miscellaneous machine work" (page 28). The report continues: "This classification is admittedly more or less rough; in some of the types, as is pointed out in the text, the operations grouped together are not all strictly homogeneous; yet they are all properly representative of their types, owing either to the common physical requirements they make of the workers or to use of the same general type of machine."

It is doubtful whether we can achieve a classification which will permit of a comparison of different groups of workers unless it is made on the basis of a study of the physiologic requirements of the component jobs. Such a classification must take into account both quantitatively and qualitatively the afferent stimuli, the motor response, and the secondary associations in the central and sympathetic nervous systems. Over two years ago the writer undertook such a classification, and became convinced that it will be workable only after prolonged study. In the report the idea followed seems to have been that the muscular handwork consisted of all heavy muscular operations; the dexterous handwork, those operations which required dexterity; but in the third and fourth groups the classification was based upon types of machines. It is not, then, strictly speaking, an attempt to classify the operations physiologically, and as far as a mechanical classification is concerned, it is difficult to understand how, from its very na-

ture, the class described as "miscellaneous" machine operations may be considered a definite entity which permits of comparison in two different plants.

In attempting any classification of occupations, the natural assumption would be that each large group or class of occupations so formed would consist of a number of jobs more or less homogeneous. This assumption is admitted on page 137, as follows: "Moreover, to insure fairness of representation within the several types, the operations whose output curves are to be components of the group curves must be both typical of the group and proportionate to such subdivisions as may compose it. These conditions are fairly met in the case of the dexterous and muscular groups; the groups are fairly homogeneous and the operations studied are as representative as the range of selection allowed." Then follows a footnote: "Representation in these groups was limited, however, by the fact that only repetitive operations producing a uniform unit of output could be used for this study." It is difficult to follow this type of reasoning. If representation in these groups was restricted because of limitations in the opportunities for making output studies owing to the character of the work, by what process have the authors arrived at the conclusion that "these conditions are fairly met?"

We are not presented with a job analysis or descriptions of the jobs falling into the various groups except in a few sample cases, general descriptions of which are given, and the only data before us are the output curves. According to the authors there is a typical curve for each type of work. To quote from the report: "Thus, for example, work requiring attention and dexterity presents one general type of curve; heavy work requiring muscular exertion, another; and so on. Various typical curves may be thus distinguished" (page 29). But the hourly output curves cannot alone serve as the basis of a job classification since there are striking differences between the curves of the jobs included in a given class. We could not, in other words, on the basis of the hourly output curves alone, group the various jobs into the classes adopted in the report. If, then, dissimilarity exists in the hourly output curves for the different jobs studied within a group, we have reason to believe that even greater dissimilarity may exist in jobs not studied, especially since the very character of the work admittedly made it difficult to obtain output statistics.

There is another condition which must be considered in any classification of occupations upon which hourly output curves are to be based. This is found whenever a worker, falling from the nature of his work into one group, works in a battery, or assists a worker falling in an entirely different group, the result being that the output of one is influenced by the output of the other. To give examples of such an occurrence in the report, we have the case of machine helpers being classed as laborers under the group of muscular work. In the case of fuse assembly the hourly output is the output of an entire battery of several hundred workers, in which there are certain operators engaged in hard muscular work, such as tightening bottom closing screws, while the output is grouped under dexterous handwork. As regards the effect of this complication upon the material of the report, in the latter instance it would be the output curve of dexterous work, in the former, the accident risk for muscular work, which would be affected, since the accident tabulation for muscular work included accidents of the machine helpers. If, furthermore, as the report indicates, the output curve in the last hours is lower in muscular work than in machine work, then we should have in this type of muscular work an artificially fast pace set by the machine operation, on the one hand, and a retarding of the machine output on the other.

Still another objection to the methods of classification, so far as it is possible to discern them, is that certain jobs have elements corresponding to different classes; for example, the job known as footpress assembly is listed under muscular handwork. It is true that the footpress portion of the job employs a large muscle group of the lower limb, and considerable muscular tension; on the other hand, the assembling portion of the work involves several movements of the fingers, hands, and arms, requiring great manual skill, before the footpress lever is operated. It is difficult to see why the authors preferred to class it according to its "muscular" aspect rather than according to its "dexterous" aspect. This is important, as the output curve for the muscular handwork group at the 10-hour plant is based upon the study of only four jobs, on which only 153 workers were engaged, and on the strength of their classification they take this curve to be representative of the output of approximately 4,250 workers.

Again, the accident statistics on muscular work are based upon a study of three jobs — the work of laborers, truckmen, and utility men — which are entirely different jobs from those upon which the output studies were based. No attempt has been made to show that the hourly output of laborers, truckmen, and utility men is similar to that of the repetitive operations referred to above, nor to determine whether the hourly accident rate for these repetitive operations is similar to the ratio for laborers, truckmen, and utility men. They were all classed as muscular work, however, and the assumption is made that the data from one sub-group may be taken as representative of the other. It is obvious, therefore, that the classification of occupations is not shown to be adequate for the use to which it has been put.

Representation within Classes. — Let us now turn from the classification to the jobs which have been studied as representative of the classes, so that we may know what proportion of the factory population was included. In the first place, we are impressed with the small number of jobs representing each class, and, in some instances, with the small number of men studied as representative of the job. For example, at the 10-hour plant, in muscular handwork only four operations were studied; in miscellaneous machine work, three operations; and in lathe machine work, two operations. For the 8-hour plant, we likewise find large groups represented by only a few operations. In certain instances we find jobs in which the output curve is based upon the study of only one man (see straighten bell, and excavate, page 44). In the case of ramming molds, occurring in the same occupational group, the curve is based upon the study of only four men — and these were men working in a battery, or unit group. The output indices for three out of five jobs constituting the muscular group in the 8-hour plant are, therefore, based on the study of only six men, while this group represents several thousand men.

The study of two jobs as representative of a group might be held justifiable if a very large number of the workers within the group were engaged upon the jobs studied. Otherwise, conclusions based upon the study of such a small number of jobs are certainly questionable, and the more so when based upon only a few individuals. To justify such a small job representation, the number of workers engaged upon each operation should be indicated. It is impossible to obtain this information for all the four types of work, but in the case of muscular handwork at the 10-hour plant definite figures are obtainable.

It is stated that, according to a census of occupations taken in 1918, 35 per cent. of the total working force was engaged in dexterous handwork, 40 per cent. in muscular work, and 25 per cent. in machine work (see page 137). On page 139 each of the three types of work is given a value of $33\frac{1}{3}$ per cent. in the total occupational census of the factory. With a working force, then, of approximately 13,000 people, there would be about 4,250 people engaged in muscular work. In arriving at the output curve for these 4,250 people, four jobs were studied (see page 50) — planish seat, retap top cap, footpress assembly, and graduate train ring. Footpress assembly, as has been shown, requires considerable dexterity, and thus occupies a questionable place in this class. It is definitely known that the greatest number of people ever employed in the plant on these four jobs was 153, distributed as follows: planish seat, 4 men; retap top cap, 15 women; footpress assembly, 130 women; graduate train ring, 4 men. Thus, only 153 workers out of 4,250 employed on muscular work were represented by the jobs studied — a representation too small to be characteristic even in the absence of other objections.

The next question which may be asked is whether the character of the jobs studied is representative of the plant as a whole. We are led to question this from a consideration of the sex of the workers, the average wage, and the type of the jobs. As regards sex, at the 10-hour plant most of the jobs studied were those upon which women were engaged, whereas the opposite was true at the 8-hour plant. One would expect that the proportion of jobs studied, upon which women were engaged, would correspond approximately to the proportion of jobs in the plant as a whole in which women were employed. It is stated (page 20) that the women at the 8-hour plant constituted scarcely more than 1 per cent. in the manufacturing departments, while at the 10-hour plant about one-fourth of the total force were women. The output curve of the 10-hour plant is based upon a study of sixteen operations. Of these sixteen jobs, women were employed exclusively on eleven, or $68\frac{3}{4}$ per cent. of all the jobs studied, whereas they constituted only 25 per cent. of the total working force. Without definite evidence it is not justifiable to conclude either that

the work upon which women are engaged, or their output curve, is similar to that of men.

As regards wages, the following statement is made on page 164: "With long hours of labor and low wages, averaging, even in 1918, piece rates of $3.20 per day for men and $2.80 for women, it is not surprising to find the turnover at this plant nearly six times as high as at the eight-hour plant, that is, 176 per cent." As a matter of fact, the average wage at the 10-hour plant during that period was considerably higher both for men and for women than the figures given in the report, being, according to the management, above $4.75 for men and $3.25 for women for the productive occupations. This does not include the skilled trades, machinists, and tool makers. Further investigation reveals the fact that apparently the wage indicated was not the average for each sex in the plant, but rather the average for each sex in the groups studied. If, then, the output curves rest upon a study of workers receiving a wage which is lower than the average wage of the plant, the suggestion at once occurs that the groups studied were not representative, but may have been below the average either as regards their quality as workmen or as regards the skill requirements of the jobs on which they worked, casting still further doubt upon the output curve for the plant.

As regards the type of work, it should be clearly pointed out that the entire output study was confined to a limited group of repetitive operations. Only those operations were studied in which there was the greatest uniformity in every step, from the raw material to the final product. Obviously variations in uniformity would affect the hourly output curve in an extrinsic way, and such a curve would not indicate "working capacity." Again it was necessary to omit those jobs in which the units of output per hour were too small to give a reliable index of the amount of work done, and those in which the product was such that it could not be conveniently measured each hour. There are many such operations in the foundry and rolling mill. A large group of maintenance departments, such as millwright, power transmission, trucking and transportation, packing, pipe and steam, tool and machine, etc., are also eliminated by the above considerations. The admitted difficulty of obtaining greater representation in the operations of the muscular group may be more readily understood when one recalls that uniformity and repetition are the features which make it possible to adapt a job to machine operation, as well as to make it suitable for hourly output studies. It is only when special sensory discriminations are required that muscular power is used in preference to steam or electrical power. (This, of course, leaves out of account the small orders for work which would not justify the expense connected with making machine tools.)

The writer does not agree that an investigation of the hourly working rate (which is preferable to the term working capacity used in the report) must be necessarily confined to the limited group of repetitive operations studied. There are at least two other means of investigation available: one, the effects of the work on the physiological function or state; and the other, the energy expenditure, or oxygen consumption, throughout the day. By such methods, it would be possible to arrive at hourly indices of working rate even in non-repetitive operations of the ordinary sense.

Accident Risk in Terms of Production. — The hourly accident risk has been determined by obtaining a record of the distribution of the accidents in each hour of the day and dividing the index representing the relative number of accidents in each hour by the index of production previously discussed. Obviously such an index will have no greater accuracy than the accident and production indices. The trustworthiness of the output indices has already been discussed. In the case of the 10-hour plant, the authors have found that the ratio of accident to production changed as the work progressed during the day, and have concluded that this change was due to the effect of preceding work, or fatigue. We are, then, not concerned simply with the accuracy of the indices, but with the more complex question of whether these indices may be taken as indicative of a physiologic change resulting from the work. We must consider, then, the various factors other than fatigue that could account for variations in the indices. The writer will summarize what appear to him to be important considerations if these factors are to be taken into account, and will use these considerations as a basis for discussion.

1. The hourly output index for a given group of operations must accurately represent the output for the same period of the day and year over which the accident statistics are gathered, and for the same group of operations. Any departure from this must be justified.

2. The hourly accident statistics must either include all the accidents occurring in the group, or an exactly proportionate number of those occurring each hour.

3. In determining the accident risk associated with production one should either deal with the actual hourly output and the actual hourly accidents or, if corrections for lost time are necessary, should demonstrate that these corrections will not produce artificialities in the results.

4. The hourly accident hazard other than that incident on production, that is, the room-hazard or environment-hazard, must be known. If this varies, correction must be made for it. This refers to such things as falling objects, flying chips, etc. Uniformity or variability includes the degree and the duration of exposure.

5. It must be shown that the accidents occurring in the course of the regular work, but over which the worker has no control, bear some constant relation to production. If they do not, corrections must again be made in the index if it is to throw light upon the physiological condition in relation to accidents.

6. It must be shown that the physical environment does not vary from hour to hour in a manner sufficient to affect the hourly accident and output rate. This refers to such conditions as light, temperature, etc.

7. It must be shown that the psycho-physiologic changes or changed reactions, which may affect accident rate or production, or the conditions that may induce these changes, are the effects of the work and not due to other causes.

Do the accident risk indices used in the report satisfy these requirements? As regards the first proposition, the output statistics consist of studies on only a few operations, lasting from two to three weeks at various times during the period of study, whereas the accident statistics, in the case of the 10-hour plant, cover the entire two years, and, at the 8-hour plant, three months.

As regards the time of day, at the 10-hour plant the first hour includes only accidents occurring from 7.00–8.00 A.M. and the last hour only those occurring between 5.00 and 6.00 P.M. At the 8-hour plant, in which the data were gathered from all three shifts, accidents recorded for the first hour are made up of those occurring between 6.00 and 8.00 A.M., 2.00 and 4.00 P.M., and 10.00 and 12.00 P.M., while for the last hour they are made up of accidents occurring between the hours of 2.00 and 4.00 P.M., 10.00 and 12.00 P.M., and 6.00 and 8.00 A.M.

Theoretically, this might affect the accident liability in two ways. First, about 40 per cent. of the workers — those on the afternoon and night shift — would come to work after having spent several hours in outside activity. We should not expect their physiologic condition to be the same as that of the men who went to work on the morning shift after a night of rest. This applies both to the degree of fatigue and to the diurnal physiologic and psychologic changes that may occur. Secondly, there would be a tendency at the 8-hour plant toward neutralizing such diurnal physical conditions as light and temperature. Approximately 90 per cent. of the workers would begin the spell with daylight, while 70 per cent. would end with daylight; 10 per cent. would begin with artificial light, and 30 per cent. end with artificial light. Since the temperature is lower in the early morning and late night, 70 per cent. would begin, and 40 per cent. would end the spell under conditions of lower temperature. (These percentages are based upon the number of men working on each shift, as shown on page 11.) At the 10-hour plant work was always begun in daylight, excepting for a brief time during the winter, and after a night's rest. For six months of the year artificial light was used the last hour, while for the entire year the temperature of the first hour was lower than that of the last hour.

If these conditions do influence working rate and accidents, we should expect a greater variation in both the hourly accident index and the hourly accident risk at the 10-hour than at the 8-hour plant, since at the former these conditions were kept relatively constant for each particular hour of the spell, whereas at the 8-hour plant no diurnal variation was peculiar to any given hour of the spell.

Again, in some groups accident and output statistics were gathered from entirely different types of operations. For example, in the muscular work the output curve is based upon the study of four repetitive jobs — footpress assembly, graduate ring, planish seat, and spin top cap — while the accidents upon which the accident risk is calculated apply entirely to truckers, laborers and utility men, that is, to non-repetitive operations. It is interesting to note that the factory records show that in the two years of study only fourteen accidents occurred to all the workers in three out of four of the jobs forming the muscular group, and that

none of these accidents occurred in the last hour of the day.

As regards the second proposition, we find for the different classes of work that at the 10-hour plant only 9,365 accidents have been analyzed out of a total of nearly 20,000 which occurred. On about 10 per cent. of those tabulated, the information is not adequate for classification according to the hour in which they occurred. The assumption is made that this 10 per cent. was uniformly distributed throughout the day, whereas some fault in accounting methods might have occurred, giving them an entirely different distribution. The statement is made that about 28 per cent. of all the accidents occurred in the class of dexterous handwork, 38 per cent. in muscular work, and 34 per cent. in machine work, whereas in the tables the analysis is based upon 1,455 accidents in dexterous handwork, 3,070 in muscular work, and 4,840 in machine work. In other words, the dexterous handwork includes only 15 per cent. of the total accidents, muscular handwork about 30 per cent., and the machine work about 55 per cent. of the total accidents analyzed. Is it permissible to assume that the unanalyzed 50 per cent. of accidents in the dexterous work would have had the same hourly distribution, and that the discrepancies in the other groups would not have affected also the hourly accident distribution? But this has another aspect, for on page 137 we find the statement: "In order, however, to compare fairly the relation of accidents to activity, the factory must be represented by occupational groups which are fairly proportioned to the actual distribution of accidents." Since the above percentages given by them were based on an analysis of only 230 accidents (see footnote, page 138), is it possible, in view of the above-noted discrepancies, that those conditions have not been met?

With the single exception of the machine operations at the 10-hour plant, all hourly output indices are corrected for lost time. In making these corrections there is the possibility that serious error has occurred because of the two kinds of lost time, since the correction was for the involuntary time only. This can be best presented by a hypothetical case. Suppose that there was an actual output of seventy-five pieces in both the first and ninth hours of the day, an involuntary time loss of fifteen minutes the first hour, and of five minutes the ninth hour of the day, a voluntary time loss of five minutes the first hour, and fifteen minutes the ninth hour, and an accident index of 100.0 the first hour, and 100.0 the ninth hour of the day. According to the methods used in the report, there would be a correction for fifteen minutes lost time the first hour, and five minutes the ninth, giving a corrected output index of 100.0 for the first hour and 82.0 for the ninth hour. Dividing the accident index by the output index for each hour, we should obtain an accident risk index of 100.0 for the first hour, and 122.0 for the ninth hour, although the same number of accidents occurred in each hour, the same number of pieces were produced, and the time required to produce each piece was the same in each hour. The accident risk, therefore, may be artificially raised by the method used in the report, excepting in the fifth, sixth, and tenth hours, for which the amount of lost time is estimated. This would cast serious doubt upon the use made of these hourly risks in comparing the different hours of each shift (page 124).

No study of accidents due to the environment-hazard was made, but the exposure was assumed to be uniform throughout the day. The distribution of this type of accident should be studied before the matter is considered as finally settled. Moreover, the accident-production ratio does not take into account time variation in exposure. At the 10-hour plant considerable lateness occurs (page 79), and at the end of the day considerable time is lost voluntarily as a result of discontinuing work. It is a fact, however, that the workers do not go home, but clean their machines or remain around the factory until the bell rings. The exposure of the worker in the morning is, therefore, reduced by the amount of time that he is late, whereas he is exposed to the factory environment for the full hour at the end of the day. In addition to this, if he cleans his machine during the closing hour, a new type of exposure occurs. Production is, however, the only exposure considered, and this must result in a high risk when production falls, but it might in no way be the result of the length of the working day. This will be further emphasized in discussing the accident risk for the last hour of the night shift, which is one hundred times greater than the average for the other hours. This indicates that there are other risks than production concerned in causing accidents.

In regard to the fifth proposition, unfortunately no analysis is made which will answer this question, although its importance is obvious. A better method would have been to

use only those accidents which were due to some commission or omission on the part of the worker. Likewise, due consideration is not given to the factors concerned in the sixth and seventh propositions.

The above requirements are more nearly fulfilled in the case of the accident hazard for the machine work at the 10-hour plant. Here power consumption is used, which corresponds to actual output. The other objections, however, have not been met. Even if we were to admit that the accident risk determined for the machine work is a valid one, there is nothing with which to compare it at the 8-hour plant, since the accidents were not subdivided according to the various types of work, and no separate hazard for machine work is shown. We are, therefore, led to conclude that the comparison of effect of the length of working day as regards the accident risk is unwarranted on the basis of the material presented.

Discussion of Evidence as Indicative of Relation of Length of Working Day to Indices

The authors have considered the less well maintained output and the greater accident risk at the 10-hour plant to be the result of fatigue due to the greater length of the working day. They have apparently even gone further and considered the output index for the different hours of the day as being a measure of the relative degree of fatigue in the corresponding hours. This assertion is not made in so many words, but is implied in the following statements: ". . . All that makes for waste of power, waste of human energies, such as the records of muscular overfatigue in the operation of ramming molds or the excessive fall of output in the heavy work known as planish seat, shall be condemned on the evidence of the figures" (page 24). Again: "It is notable that even at this plant, where fatigue is least registered in the curve of output. . . ." (page 123). The writer does not wish to imply that fatigue may not be an important factor, but the evidence as presented does not justify the conclusions reached. Even though our measurements, whatever they be, demonstrate fatigue in a given activity, we should not draw further conclusions without obtaining light upon the ultimate effects of the work. Even though hourly output be definitely shown to be a measure of fatigue, it measures acute daily fatigue only. Further studies are required to enable us to say whether or not a given degree of acute daily fatigue is sufficient to constitute a health, economic, or social hazard.

In view of the statement that stereotyping was widely prevalent at the 10-hour plant, it is difficult to see how the output curve can be assumed to be a fatigue curve. It is also stated, it is true, that no stereotyped operations were included in the output curves, but it is doubtful whether this is strictly the case. On pages 84 and 85 is given a list of operations grouped as non-stereotyped, greatly stereotyped, etc. When the quotient obtained by dividing the interquartile range by the median is small, it is apparently taken as an indication of great stereotyping. On the basis of this standard the writer questions the statement that no stereotyped operations are included in the output studies, for this ratio is very low in the case of the retap top cap operation as compared with certain operations listed as greatly stereotyped, yet it is included in the group of muscular operations. Although the hourly output curve does not show the late afternoon rise frequently seen in stereotyped operations, the daily output in the same workers was lower by one hundred pieces in the second period of study, occurring six months later.

Again, it is difficult to see how the output curve of a group or battery of workers can be considered a fatigue curve. In the fuse assembly, the hourly output consists of the number of completely assembled fuses, requiring 100 or more different operations and employing about 300 workers. If it is to be taken as a fatigue index, it must be considered a "group fatigue test." While the writer does not intend to argue that the output is not influenced by fatigue, knowing, as we do, that fatigue may sometimes be followed by an increase in the muscular performance, he feels that output curves, in the present state of our knowledge, can hardly serve as a measure of fatigue.

As regards the accident risk indices as indicative of fatigue, those presented cannot be admitted in the light of the foregoing criticism. But this is not all. From the output indices in the report, and from accident statistics available at the 10-hour plant for the period over which the accident statistics on the day work were gathered, the writer has prepared the hourly accident risk indices for the night work on the machine operations. This is a most useful comparison in considering the question of

whether the high ratio of accidents to production in the tenth hour is due to fatigue, since we have the opportunity of comparing the tenth hour of day work with the tenth hour of night

TABLE 1. — ACCIDENT RISK FOR NIGHT WORK, USING PRODUCTION INDICES SHOWN IN TABLE 30, PAGE 148

Working Hours	Percentage Variation from Average Hourly Rate		Actual Number of Accidents	Accident Risk Indices on Basis of Minimum Hourly Ratio (7th hr.)
	Production Indices	Accident Indices		
1	110.9	111.6	152	290.2
2	118.3	175.6	239	428.1
3	120.5	163.1	222	390.7
4	120.6	112.4	153	268.9
5	117.3	113.8	155	279.9
6	102.5	90.4	123	254.5
7	110.2	38.2	52	100.0
8	110.9	88.2	120	229.4
9	108.5	93.2	127	247.8
10	106.2	91.1	124	247.5
11	98.8	81.6	111	238.3
12	74.7	88.9	121	343.3
13	0.49	51.4	70	30,264.9

work in the same plant, in which there is a similarity of conditions.

Table 1 shows the hourly production index, the actual hourly accidents, the hourly accident index, and the accident risk index. In this table the production, the accidents, and the accident risk are all determined in accordance with the method used in the report. However, in the case of night work there was considerable overtime from 6.00 to 9.00 P.M., so that the number of people working between the hours of 6.00 and 9.00 P.M., and consequently the exposure to accidents, was greater than during the remainder of the night. We may then revise our table so that all hours are compared with the fourth hour, and for the sake of ready comparison the same thing may be done with the table covering the day work, that is, Table 18 in the report. This in no way alters the relations of the various hours, but merely changes the magnitude of the various index numbers, for convenience in comparison. (See Table 2.)

The tables show that the accident risk for both the tenth and eleventh hours at night is very low, the eleventh being lower than any hour except two. The risk then rises, and is enormous the thirteenth hour. This appears to be similar to conditions in the day shift, when the risk rises the last two hours, but the last two hours of the day shift correspond to the tenth and eleventh hours of the night work, in which no such rise is seen. (Twenty minutes are lost in the first and the seventh hours.) Certainly it could not be assumed that night work was less fatiguing, although if we were to follow the reasoning used in the report we should have to conclude that there was less fatigue in the eleventh hour of night work than in the ninth hour of day work, since there is a rise of the index in the latter and a drop in the former. Furthermore, the fact that the risk is one hundred times greater for the thirteenth hour suggests that it is not the length of the shift alone in the 10-hour day that is responsible for the greater risk of the last hour, but that there are other factors peculiar to that last hour whether it be the tenth or the thirteenth.

To make the accident risk indices for the night and the day work exactly comparable, power consumption indices should have been used in place of actual output indices. However, comparison of output figures and power consumption in the day shift (pages 60, 70, and 110) indicates that the use of such indices could not change the results sufficiently to affect the above criticism.

The objections raised to the methods of obtaining the accident risk indices and the production indices seem to invalidate their use in comparing the different hours of the day, the different spells, the different types of occupation, and the two plants.

In drawing conclusions based upon the indices used, the authors have assumed that they

TABLE 2. — COMPARISON OF ACCIDENT RISK FOR NIGHT WORK AND FOR DAY WORK

When Fourth Hour Equals 100.0

Working Hours	Accident Risk Indices for Night Work	Working Hours	Accident Risk Indices for Day Work [1]
1	107.9	1	72.4
2	159.2	2	87.6
3	145.3	3	95.2
4	100.0	4	100.0
5	104.1	5	93.3
6	94.6		
7	37.2	6	78.8
8	85.3	7	98.8
9	92.2	8	100.3
10	92.0	9	105.0
11	88.6	10	116.9
12	127.7		
13	11,254.7		

[1] Derived from Table 18, page 110, of Bulletin 106.

could not have been materially affected by any other differences between the two plants than the length of the working day. Although they state (page 20) that "allowance must yet be made for the inevitable differences existing between any two individual establishments," it is not clear that they have made any such allowance. As regards the hourly output indices of the jobs studied, they have not demonstrated that it is the length of the working day rather than the jobs themselves, or other differences, which may account for differences in the output curves in the two plants. The highly standardized product continuing unchanged from year to year at the 8-hour plant, and the conditions resulting therefrom, have not been sufficiently appreciated in this connection. A brief comparison of the two plants may be useful in showing that there are other differences than the length of the working day capable of affecting the hourly output.

The 8-hour plant, as anyone would know from the fact that it is one of the foremost automobile plants, has a highly standardized product, in which the management has had years of experience in setting the production rates and determining the maximum output to be expected of the workers. Under such circumstances, a definite production schedule is established, and there is a highly uniform flow of work from department to department and from operation to operation in order to deliver a definite number of finished cars per day. This has resulted in the setting up of the operations and machines, some of which are automatic, in such relation to each other that by the use of gravity work-slides, roll-ways, endless chain and endless belt power-driven conveyors, the work is kept flowing uniformly from one operation to the next. This results in closer supervision of the workers in maintaining a regular flow of work to avoid "choke" points. In other words, there would tend to be a more uniform hourly stimulus toward production.

At the 10-hour plant with a diverse product, the fuse work was new to the working force, and hundreds of new piece rates on new jobs were set during the period of study. In its regular commercial product, operations sometimes ran continuously for months, but in many other cases the orders were run through on a given job even in less than a day. In addition to this, the period of study was also a period of increased growth, doubling the number of people employed, whereas at the 8-hour plant a much longer experience on the part of the worker was the rule. Recognizing the fact that the jobs were frequently changed, that time was required for learning, and that production could not be so carefully scheduled, the rates were set at the 10-hour plant with considerable time allowance for changes, repairs, and pauses of the workers on their own account. At the 8-hour plant, on the other hand, foremen made hourly output studies of the individual workers on their own account. While we do not know to what extent these differences affected the hourly output curves, one might expect in either an 8-hour day or a 10-hour day a more uniform hourly output in a plant making a highly standardized product. We should certainly know the extent to which the output curves were affected by these important differences before ascribing as a cause the length of the working day.

Unfortunately direct evidence was not obtained in regard to the effect of inexperience at the 10-hour plant upon the hourly output or upon accidents. Possibly the accidents in the year 1915 may be significant in this connection, since this is the year in which the first great additions of new working force began. In the year 1917 the accidents of the tenth hour were 125 per cent. of those occurring in the first hour, in 1916 about 95 per cent., but in 1915 only 50 per cent. This better showing of the tenth hour in 1915 should be explained before drawing conclusions regarding the cause of the higher accident risk of the last hour.

Before leaving the question of the interpretation of these indices the writer would like to add an observation which is not alone interesting in connection with the accident risk in the different hours of the day, but which further serves to indicate the complexity of the subject. The point in question is the relative speed in working the different hours of the day. This can be determined by taking into account the actual number of pieces of product finished during various hours of the day and the actual working time obtained by subtracting from the hour the total voluntary and involuntary time lost. For two of the machine operations shown in the report these calculations have been made. Table 3 shows the average number of seconds required for the various hours of the day. In both of these operations the time required for each piece in the last hour is much shorter than that required in the first hour, with which all others are compared in computing accident

risk, and the average time in the last hour is below the average time of all the hours of the day. This is significant because speed has been shown to be an important factor in accident

TABLE 3. — AVERAGE TIME REQUIRED FOR MACHINE OPERATIONS EACH WORKING HOUR

Operation	Average Time in Seconds Required Each Working Hour									
	1	2	3	4	5	6	7	8	9	10
Face and score train ring	11.3	9.5	9.8	7.9	7.8	9.9	8.9	9.9	8.0	8.2
Spin top cap	24.1	18.5	17.3	14.8	15.2	18.0	17.6	16.9	16.2	15.3

risk, and it exemplifies the necessity of taking other conditions into account.

Criticism of Indices Used as Measures of Efficiency

Even if the hourly output indices were admitted as representative of each factory as a whole, their use as a basis of comparison of the efficiency of two different factories must still be justified. It must be borne in mind that these indices are entirely relative, and in no way indicate which factory was the more efficient in its own maximum hour. A factory might have an output in which the index was 100.0 for each hour of the day, and yet be working at only 50 per cent. of its possible maximum.

On the basis of a study of less than a half dozen jobs, it is stated that there was a greater amount of lost time at the 10-hour plant. But in order for this to establish proof of the greater efficiency of the 8-hour plant as regards output, it should be shown that the lost time at the 10-hour plant was sufficient to have actually reduced the length of working period to, or approximately to, eight hours. The mere statement of the hourly output indices does not enable one to form a clear idea of the amount of time lost through slowed working and voluntary pauses, which is stated as the cause of the less well maintained output curve at the 10-hour plant. Since these pauses are important only as they affect output, and since the hour of maximum production in the two plants is considered on a par, it is possible to determine the total amount of time lost in this way with the same degree of accuracy with which the output indices are determined. Using the output indices given on page 74, we have calculated the amount of time lost hourly at each plant as shown in Table 4. Therefore, slowed production and voluntary pauses amount to 43.2 minutes at the 10-hour plant and 16.7 minutes at the 8-hour plant.

It is obvious from this that the 10-hour plant cannot reduce its day to eight hours and maintain the same production unless the production of the maximum hour is increased. The hourly output indices obviously must have a very limited use as a comparative measure unless we can obtain information which will enable us to evaluate the maximum hour.

There is both a human and an economic question regarding the relation of accidents to efficiency. When there is an actual decrease in the number of accidents occurring in the last hours of the day, the writer is inclined to question whether we are not going too far in attaching a great deal of importance to the ratio of accidents to production. Considering the ques-

TABLE 4. — LOST TIME AT THE TWO FACTORIES ABOVE THAT LOST IN HOUR OF MAXIMUM PRODUCTION BASED ON PRODUCTION INDICES SHOWN IN REPORT

Working Hours	Average Production Index	Minutes Worked When Maximum Hour Is Given Value of 60 Minutes	Minutes of Lost Time by Which Each Hour Exceeds Maximum Hour
8-Hour Plant			
1	89.6	55.2	4.8
2	96.4	59.4	0.6
3	97.4	60.0	0.0
4	94.4	58.2	1.8
5	95.7	59.0	1.0
6	94.4	58.2	1.8
7	94.2	58.0	2.0
8	89.8	55.3	4.7
		Total	16.7
10-Hour Plant			
1	82.7	51.0	9.0
2	93.8	57.9	2.1
3	95.6	59.0	1.0
4	97.2	60.0	0.0
5	90.4	55.8	4.2
6	90.1	55.6	4.4
7	91.6	56.5	3.5
8	91.1	56.2	3.8
9	90.7	56.0	4.0
10	79.1	48.8	11.2
		Total	43.2

tion from the human standpoint, the worker is exposed to a certain number of accidents in the factory in which he is employed. The chief question which concerns him is whether it is more dangerous for him in the factory in the ninth and tenth hours than in the other hours of the day. In other words, the number of accidents per man per working hour is the worker's chief consideration rather than the number of accidents per unit of production. The figures in Table 22 of the report show that from his standpoint only the first, fifth, and sixth hours are preferable to the tenth hour.

From the purely economic standpoint the question of ratio of accidents to production may merit consideration. We might ask what is the cost of accidents in the various hours of the day per $100.00 of product. Using the production indices and the accident indices shown in the report, and the data on compensation for accidents available from other sources, the writer has calculated this cost. It is found to be approximately 3.7 cents greater in the tenth hour than in the fourth hour, which is an hour of relatively high production — a cost hardly sufficient to be of importance. It is not the wish of the author to be understood as attempting to place a dollars-and-cents value upon human injury. It is difficult to express the seriousness of an accident so that it may be used for statistical purposes, but the lost time is one of the indices of the seriousness of an accident, and compensation for it is certainly a manufacturing cost. This calculation is interesting in connection with the question of accidents and efficiency.

The report indicates neither the relative seriousness of the accidents at the two plants nor the relative number of accidents per worker, the assumption being made that it is only of importance to determine the hourly ratio to production. It does not, however, seem to be entirely irrelevant to compare the accident frequency per hour at the two plants. From the figures given in the report in Tables 21 and 22, we may calculate the number of accidents per man per unit of time at the two plants. A simple calculation will reveal the fact that the accident risk for the 10-hour plant, as compared with that of the 8-hour plant, is as 1:1.40; in other words, the actual danger to the worker from accidents per hour is greater at the 8-hour plant. The ratio per man per working day at the 10-hour plant, as compared with the 8-hour plant, is as 1: 1.12. There is no evidence to indicate whether or not this difference is due to the method of working, the length of day, or mechanical conditions, but it has not been proved to be irrelevant.

In concluding, it may be said that in view of the objections to the output and accident indices, neither can be accepted as valid either for the plant as a whole or for a sufficient part of either plant to be truly representative. The evidence on lost time is not conclusive, nor is that on stereotyping, which at best was used only as corroborative evidence. Moreover, even if we were to grant the validity of the use of the output and accident indices in estimating the efficiency of various hours in the same plant, we could not draw conclusions in regard to the relative efficiency of the two plants, since the maximum hour is not evaluated. A measure of output comparing only the relative hours of the day would not go far in helping to solve the workday from the standpoint of wartime needs, which were, to quote from the introduction of the report, "to attain maximum production without prejudice to national vigor." The greatest hourly efficiency, the standard used in the report, might possibly be attained on a 4-hour day, but with even a lesser hourly efficiency we undoubtedly would attain a greater daily, monthly, or yearly efficiency on a workday of greater length, if we define efficiency as the greatest production with the least cost compatible with reasonable health, social, and cultural standards. The standards of efficiency employed — namely, maintenance of output, lost time, and accident risk — may be of value in the study of the most efficient working day when based upon a better occupational classification, when sufficient data and controlled data are gathered, and when measurements according to these standards are correlated with other measures, such as percentage of accident and illness incidence in the succeeding months or years of employment, comparative functional studies of organs and tissues, comparative studies of total daily, weekly, and monthly output, spoiled work, labor turnover and transfers, studies of behavior reactions, the quality of the workers attracted by the workday of different length, etc. Factors other than the length of the working day must be ruled out, and this may be accomplished by the study of different shifts in the same plant working a different number of hours, or by the study of a greater number of plants.

Space does not remain nor does the writer feel that it is necessary to point out the obvious advances which have been made in the present study, and the valuable influence which it must have on future work. The attempt to compare two different plants on the basis of representative hourly output and accident risk curves, derived from studies resting upon a common job classification, constitutes a bold stroke in a new direction, and should stimulate further research. Among other things, it exemplifies strikingly the necessity of a physiological analysis of industrial occupations.

It is unfortunate that the limitations of the material were not more carefully pointed out, since the problem is obviously still in the experimental stage, and that such sweeping conclusions were reached as those on page 26, even though it might have been necessary to sacrifice some of the interest of the general reader.

A REPLY TO DISCUSSION OF PUBLIC HEALTH BULLETIN NO. 106, COMPARISON OF AN EIGHT-HOUR PLANT AND A TEN-HOUR PLANT

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Dr. Ryan's interesting discussion of Public Health Bulletin No. 106 deals almost entirely with the statistical treatment of the material collected. As the officer chiefly responsible for this phase of the investigation, I am very glad to avail myself of the opportunity to reply to his criticisms. Dr. Ryan makes so many diverse points that it is difficult to know where to begin. As space is somewhat limited, however, I shall adopt the plan of indicating certain general errors in thought to which the majority of Dr. Ryan's points can be attributed, such independent points as remain being then considered individually.

Anyone, however scientifically trained, who has not had the experience of sifting multitudinous data in such a way as to answer specific problems, is likely to theorize at the expense of one or two practical rules that have to be observed under the given circumstances. These rules may be briefly formulated as follows: The exact problems to be solved must be constantly kept in view in relation to the means for solving them; and a sense of perspective should be exercised to keep the right proportion between factors found to be of primary import to the solution of the problem, as against factors of secondary or tertiary import.

In his criticism, Dr. Ryan seems to lack this sense of proportion. He does not keep in mind the specific problem on which conclusions were drawn; he is almost exclusively exercised over points of secondary if not of tertiary importance to the problem; and he forgets that, desirable as it may be to analyze and evaluate the effect of all possible factors however improbable their connection with the issue, this is not practically feasible under present conditions of industrial and scientific organization.

We may, therefore, bring the majority of Dr. Ryan's points of criticism under the following heads: (*a*) criticisms due to a misunderstanding of the exact problem as to which conclusions were drawn; (*b*) criticisms that fail to distinguish the first-rate from the second-rate and third-rate considerations involved in the problem; (*c*) criticisms which, in evaluating these subsidiary considerations, insist on an idealistic perfection wholly impracticable in the present state of our knowledge and opportunities for knowledge. The few independent points that remain for consideration will then be found to consist in (*d*) criticisms of the hourly curves of accident risk per unit of production which were presented in the Bulletin.

Misunderstanding of Problems Involved. — The main problems to which the investigation under discussion attempted to find an answer — and the answers as far as they could be ascertained are given in the conclusions of the Bulletin — were briefly as follows:

1. To find the relations between consecutive hours of the working day for various operations within the same plant in the matter of output, accidents, and other indices of human working capacity.

2. To contrast the relations found within each plant as between the two plants; the actual showing of each plant being first compared with its *own* best showing. This is not a direct but an indirect comparison of the records of output, accident, etc., of each plant.

Dr. Ryan's great mistake — one which involves one-third of his entire discussion — is in supposing that it was the object of the Bulletin to form a complete picture of each plant in isolation and for its own sake. There is nothing printed in the conclusions on page 26 (which Dr. Ryan apparently takes as his center of attack) to warrant this belief and the deliberate procedure of the authors as explained in the Bulletin definitely contradicts such a notion.

If the authors of the Bulletin aimed to give an all-comprising, duly proportioned picture of each plant, why did they deliberately falsify this picture for the 10-hour plant by combining the output curves for the different types of work at this plant, not in proportion as these types were found to occur at the 10-hour plant itself, but on the contrary as they were found to occur at the 8-hour plant? While Dr. Ryan is busily engaged in criticizing some small points that prevent a true picture being drawn of the output at the 10-hour plant as a whole, he apparently omits to see this enormous error which the authors deliberately committed.

The fact is that Dr. Ryan is here following the wrong trail. An output curve was built up to comprise all the operations studied in each plant in certain definite proportions, for the purpose of comparing the two plants *in respect to the same types of work*. It was definitely recognized by the authors of the Bulletin that if the length of hours factor was to be considered in its relation to output, many other factors affecting the shape of the output curve must first be equalized as between the two plants. Previous work, particularly that of the British Association Committee on Fatigue, had shown that the type of work had an enormous influence on the shape of the curve. Consequently, the type of work was considered a primary factor, and the greatest care was taken to eliminate its effect as well as that of all other primary factors such as inexperience, deliberate restriction of output, lack of incentive, stoppages enforced on the workers by machine breakdowns, and so on. The method and reason for eliminating the disturbing effect of the type of work factor is clearly given in the Bulletin itself (pages 74 and 75).

"For a fair comparison of working capacity and production at the two plants it is obviously necessary to compare the output of processes and types as nearly alike as possible at each factory in order to exclude all differences except the point at issue, and that is, the difference in the length of the workday. Obviously again, in a general metal-working establishment such as the 10-hour plant, there are many processes and operations not included in the representative output of the automobile factory. We must, therefore, for our present purpose take figures representing not the total activity of the factory but the average of the four types of work studied at the eight-hour plant."

The authors were mainly concerned, then, in obtaining output curves from similar types of work in each of the plants studied and in giving each type equal weight, not primarily in "representing the total activity of the factory." The text of the Bulletin is absolutely definite on this point.

The main attack in Dr. Ryan's entire criticism of classification of occupations and of representation in classes seems to me, then, directed against the proverbial man of straw which he himself has erected, and we must contradict his statement that the classification of occupations "is not shown to be adequate for the use to which it has been put." To prove it inadequate, Dr. Ryan would have to show that the method of classification and the operations within each class are different in the two plants. All he does show is that in the case of both plants the classification is a rough one — a point fully admitted in the Bulletin — and that within each class non-repeated jobs are necessarily excluded — a point also admitted.

No doubt, Dr. Ryan was misled by the term "representative" used in connection with these composite curves; but after all, when we send representatives to Congress they represent us only for some purposes and not for others, and similarly these output curves must be considered in relation to the specific purposes to which they are put, and not as representative for all purposes.

There is one other error into which Dr. Ryan has fallen as a result of a misunderstanding of the problems on which conclusions were drawn. It is nowhere maintained in the Bulletin that the total gross production of the 8-hour plant was greater than that of the 10-hour plant, or that the total gross production of the 10-hour plant would be increased by a reduction to an 8-hour schedule. The authors were fully aware that the data for formulating such a conclusion were not in their possession. Efficiency, which is the word used in the Bulletin, means a good deal more than mere production. As agreed upon by a long line of economists and supported by the conceptions of scientific management, efficiency is considered as a relation between production and costs,* and it is unquestionable that, other things being equal, the heavier the hourly variation in output throughout the shift, and the greater the lost time, accidents, and restriction of output, the less the relative efficiency. This being the case, Dr. Ryan's table showing that lost time, though two and a half times greater at the 10-hour plant, is not great enough to make the total gross production of the 10-hour plant less than that of the 8-hour plant, is beside the point, and introduces as well a rather confusing notion of lost time.

Lack of Discrimination of Relative Importance of Factors. — The mere fact of misunderstand-

* Costs may be taken as including the costs in money to the employer only, or the costs (often not measurable in money) to the community at large. If costs be taken in this latter sense, efficiency may be summed up justly as "maximum production without prejudice to national vigor," and we fail to see Dr. Ryan's implication of a contradiction between the phrase in the introduction of the Bulletin and the use of the word efficiency in the conclusions.

ing the problems involved would in itself, of course, lead to a faulty evaluation of the relative importance of the various factors. Thus, Dr. Ryan devotes considerable space to the discussion of the methods of classifying occupations and of the proper representation within the classes — factors of distinctly secondary importance in comparison with the question of adopting the same classification and representation for both plants.

Such instances have, however, already been mentioned under the discussion of the misunderstanding of the problems involved and may be passed over for the present. I wish to show here that even where the problem at issue is grasped, Dr. Ryan has failed to see the relative importance of the several factors, and, indeed, once or twice in his own calculations has overlooked factors of obviously prime importance. Thus, Dr. Ryan calculates that "the actual danger to the worker from accidents" per working day is greater (by 12 per cent.) at the 8-hour plant than at the 10-hour plant. Aside from the possibility of deriving this figure from the information given in the Bulletin, Dr.Ryan has here overlooked a factor of cardinal importance. He has not considered whether the tradition of what constitutes an accident may not be very different in the two plants, nor has he considered the possibility that the 8-hour plant with six widely distributed first-aid stations may have recorded more of the less serious accidents which occurred than did the 10-hour plant with but one first-aid station (two at the end of the period studied). In fact, to compare *directly* the accident frequency of the two isolated plants is, from a scientific standpoint, extremely indiscreet.

Again, in criticizing secondary points, Dr. Ryan entirely omits to watch considerations of primary importance when he questions the representative character of the sample of accidents taken at the 10-hour plant. Two questions are here involved: (1) the reliability of the sample as to the distribution of accidents over the hours of the day; (2) the reliability of the sample as to the types of occupations comprised.

In the Bulletin we made an assumption about point (1), while Dr. Ryan in his discussion makes an assumption about point (2). I venture to think that while our assumption neglects at most only a tertiary consideration (that is, a bookkeeping omission as to the hour of occurrence in 10 per cent. of the cases — an omission as likely to occur in one hour as another), Dr. Ryan's assumption neglects a primary consideration applying to a majority of the cases. He assumes that 20,000 accidents are distributed as to the type of work in the same proportion as the 9,365 accidents analyzed by us. As a matter of fact, the main reason for rejecting in this analysis over half the accidents was the disorderly way in which certain of the occupations of the injured employees were listed at the factory office. For instance, some clerks, when in doubt, invariably put down "laborer" as the occupation of a male employee, and so on. The investigators were, therefore, forced to pick only accidents occurring in those occupation classes that were found free from this "dumping" process, and there happened to be more of such occupations free from doubt in the machine type of work than in the muscular and dexterous types. What Dr. Ryan notes as discrepancies in the Bulletin are, therefore, in this instance the result of a false assumption on his part as to the relative accuracy in reporting accidents in different classes of occupations. On the other hand, the 230 accidents taken at random, which the investigators analyzed in detail, would, I think, constitute in the opinion of most statisticians a reliable sample, at any rate for purposes of division into but three fairly equally populated types.

In the instances just given, it is evident which are the primary and which the subsidiary factors. It may be answered, however, that in a great number of cases the exact importance of any given factor cannot well be known offhand. This is perfectly true and Dr. Ryan probably does not realize the amount of preliminary statistical work that was undertaken to determine this very question of relative importance. He brings forward in particular some considerations as of primary importance which, after a preliminary investigation, we assigned to second or third place as far as the operations selected for study were concerned. These considerations are as follows:

1. That the accident-output ratio is unduly affected by the variations in the amounts of corrected and uncorrected lost time as between different hours. The authors admit in the Bulletin that actual output would be preferable to corrected output for use as the base of the accident-output ratio. "In order, however, to avoid introducing a different though closely resembling set of curves" (page 105) they decided to hold to the corrected curves used in the

earlier chapters. This decision was made after it had been found that the error involved was not great, and that in so far as there was an error, it would tend to understate the accident risk. In fact, the corrections seriously affecting the output curves occurred only in the hours of starting and stopping work at the 10-hour plant — *i. e.*, the first, fifth, sixth and tenth — and due allowance (as Dr. Ryan agrees) was made in these cases. Such a large correction as Dr. Ryan supposes to occur in the ninth hour of an average output curve, actually, it was found, never does occur, and Dr. Ryan seems here to raise a hypothetical difficulty of small practical importance.

2. That there were more women employed at the 10-hour plant, and that relatively women are over-represented in the operations selected there. The latter point is questionable. At the 10-hour plant investigation showed that 25 per cent. of the employees were women, and that 68 per cent. of the operations studied engaged women. At the 8-hour plant 1 per cent. of the employees were women and 13 per cent. of the operations studied engaged women (three out of twenty-three). In short, women were over-represented at both plants, chiefly because a larger proportion of women are usually engaged in repetitive jobs.

As to the effect of sex on the output curve, the evidence was found to be negative. If within the same plant and the same type of operation the curve for men be compared with the curve for women, neither appears to be maintained any better than the other.

3. That relatively unskilled workers were selected in the 10-hour plant. I have no means of checking the figures which Dr. Ryan gives as representing the average wage throughout the plant, though from the investigation which we made at the time these figures seem to me considerably too high. Possibly they do not refer to the beginning of 1918 when our output observations took place, and may include also the special bonus. However this may be, there is no question that repetitive jobs call for a relatively low grade of skill. But this again applies to both plants.

4. We may here group together a number of points raising the whole question of the comparability of the two plants as to industrial and technical organization. Dr. Ryan maintains that even the indirect comparison which we attempted is valueless because: (*a*) in spite of our careful exclusion of operations in the 10-hour plant where output was found restricted, some restriction is evidenced in a few of the operations remaining; (*b*) the 10-hour plant often worked on short orders while the 8-hour plant had a uniform product; (*c*) the 8-hour plant was more standardized and in particular employed more conveyors and automatic machines, while its "foremen made hourly output studies of the individual workers on their own account." In contrast with these devices, "the rates were set at the 10-hour plant with considerable time allowances."

(*a*) Dr. Ryan is not fully informed as to the methods used in detecting restriction of output. The narrowness of the deviation between the output of individuals was not by any means the sole test of restriction. In a special study the investigators plotted the frequency curves of the daily output of individuals in various operations, and set aside as restricted those which showed a negative "skew." The method is discussed in a recent article by the writer in the *Journal of the American Statistical Society*, September, 1920, and there is no need to enter more fully into the matter here.

(*b*) At the 10-hour plant, as a matter of fact, the investigators particularly avoided studying short orders. Besides the long period required for observation, a rule was made that only those workers should be observed who had already been a long time on the job, and before selecting an operation for study it was always ascertained whether that operation was to be continued over a considerable period of time. The operations selected in the 10-hour plant do not, therefore, show a great contrast with those of the 8-hour plant; some of them, indeed, were running before the 8-hour plant was even founded.

(*c*) In the operations actually selected at the 8-hour plant at least eighteen out of the twenty-three listed had no conveyors connected with them,* and no automatic machines whatever were studied. As to the foremen's records, the investigators collected samples of these wherever they were kept (in seven departments out of the sixty-eight), and found them to have very little importance in practice. The figures given seem to have been based largely on the

* Excess of stoppages for lack of materials, which might have been caused at the 10-hour plant by relative absence of conveyors, would be allowed for by the "correction" of the output. As a matter of fact, conveyors were used for a large number of jobs also in the 10-hour plant, and one or two of these jobs were studied for the Bulletin.

foremen's idea of what would most please the management.

Concerning the piece rates set, there is no question that at the 10-hour plant workers were not able to earn as much pay per day as at the 8-hour plant, however many allowances may have been made. Human needs in food, clothing, shelter, etc., being much the same whether the employee works eight or ten hours, it follows that the "economic" stimulus to produce must have been distinctly greater at the 10-hour plant than at the 8-hour plant where a "comfort" wage was paid on a purely time basis.

Insistence on Impractical Perfection in Evaluating Subsidiary Factors. — Even in the case of factors found to be of secondary or tertiary importance it would undoubtedly be desirable to be able to evaluate their importance quite exactly, and in the further progress of the science this refinement will, no doubt, be achieved. But it is surely expecting a little too much of an investigation limited in time and funds that its methods should have leaped to perfection in the minutest details. Though recognizing the facts in his concluding paragraphs, Dr. Ryan here fails to keep in mind the rudimentary basis on which the investigators had to build and the real progress in technic which they succeeded in achieving.*

Dr. Ryan tells us that two means of investigating non-repetitive operations are available: one, the effects of the work on the physiological function or state; and the other, the energy expenditure or oxygen consumption throughout the day. In a fairly exhaustive acquaintance with the literature of industrial fatigue I fail to recall any application in industry of the latter test, and, in truth, the whole series of psychological and physiological tests of fatigue seem to have fallen on evil days. We find Dr. Stanley Kent in his second report on *An Investigation of Industrial Fatigue by Physiological Methods* turning to pure output studies, and we read of the abandonment by the present British Industrial Fatigue Research Board of the search for psychological tests. Facts such as these are not necessarily conclusive for the future conduct of fatigue investigations, but they certainly are conclusive as to the inadvisability of using these tests in Bulletin No. 106.

Again, as a basis for job classification, Dr. Ryan demands a classification which shall "take into account both quantitatively and qualitatively the afferent stimuli, the motor response, and the secondary associations in the central and sympathetic nervous systems." No one is in greater agreement with this general plan than I. In fact, I have consistently advocated it for the last five years, and have come to the same conclusion as Dr. Ryan — namely, "that it will be workable only after prolonged study." And this is the precise point.

The method of job classification which the authors of the Bulletin used has since been fully presented by the writer.† The following reasons made it seem adequate for the purposes of the Bulletin:

1. The same method, as stated above, was used in both plants.

2. The basis of classification was thoroughly objective, and the inclusion or exclusion of a given job from any class was not determined by personal bias on the part of observers.

3. It marked the first step in a physiological classification. Work with and without machines makes distinctly different requirements of the human organism, and the division within the no-machine group was based on the part of the body engaged. It was recognized that there were few operations in this group where the worker did not *handle* his material, but dexterous work was defined to exclude operations like footpress assembly, where body or feet were used as well. Within machine work, lathe work covers only those cases where the man "operates" the machine in the strict sense of the word, while miscellaneous work covers those cases where the man's work is to steer, tend, feed, or stock the power-driven machine. Most of these sub-types, it should be said, were represented in both plants.

4. The classification bore some relation to the actual classification that we found in use for practical factory purposes and thus the inclusion of all the jobs within a given factory was made easier.

5. There are certain remarkable agreements in the shape of the curves between the same type in the different plants, but quite distinct characteristics as between different types in the same plant.

6. When comparing the different classes of occupations thus formed with the number of employees they engage, each class was found to account roughly for an equal portion of the

* In the matter of accidents as an index of fatigue, this development in technic is sketched in the Bulletin itself.

† See last chapter in Muscio's *Lectures in Industrial Administration*, Isaac Pitman and Sons, London.

factory working force. This enabled equal weight to be attached to each type.

It should be said that the scheme of classification which we adopted was not based on any one of the six reasons advanced above as Dr. Ryan seems to think, but rather on a joint consideration of them all. The exact method of classification was, for the purpose of the investigation, a secondary consideration provided the same classification was adopted at both plants and the same weight given to each type of work. But in spite of the relative unimportance of the matter, I would maintain that the Bulletin puts forward a very practical and useful scheme for classifying industrial occupations, and with this as a basis has brought together output studies from more diverse types of industrial operations than have appeared together before.

Criticism of Curves of Accident Risk per Unit of Production. — There remain a number of points of criticism concerned with one section of the investigation — namely, the hourly accident-output curve. The Bulletin presented curves of this nature for the two plants as a whole and for the muscular, dexterous, and machine work types of occupation in the 10-hour plant. By this means an attempt was made to find the risk of accident per unit of production, and to meet the objections of Dr. Vernon and others to the use of an absolute accident curve as a measure of fatigue. The history of this whole controversy, which largely determined the methods that we adopted, is given in the Bulletin (pages 95–100).*

Dr. Ryan brings forward a counter-objection that there are factory environment hazards varying throughout the day as well as production hazards, and apparently urges a return to the absolute accident curve. He also points out that our accident curves do not refer to quite the same group of workers as do our production curves.

Here it is admittedly important to obtain a production curve thoroughly representative of all the operations which the accident curve covers, and the investigators did their utmost in this connection to improve upon previous work. For the 10-hour plant the compounding of an output curve out of three distinct type-of-work curves was based on a searching occupation census taken at the plant, and the power consumption curve, instead of sample output curves, was used to represent machine work. Admittedly, for reasons given in a footnote (page 138) it was difficult to obtain a full sampling of muscular work, though dexterous work, being largely repetitive, was probably fairly sampled.

In spite of the imperfections admitted in the Bulletin itself, the results seem to us significant for two reasons. Even if the accident-output ratio curves be set aside and a return made to the absolute accident curves, the difference in result is one of degree rather than of kind. These absolute accident curves are given in the tables and the diagrams of the Bulletin just as fully as the ratio curves, and anyone unable to accept the prevailing opinion among investigators as to the advantages of the ratio curve may satisfy himself by reference to the original data.

Secondly, the differences noted between the curves of the two plants and between the three types of work in one of the plants are so remarkable and so consistent that it would require considerations much more serious than Dr. Ryan has brought forward to upset our conclusions. The best founded of Dr. Ryan's contentions is that objecting to the merging of the three shifts at the 8-hour plant. Undoubtedly this had the effect of smoothing the 8-hour curve to a certain extent, though not nearly enough to wipe out the very marked difference between the 8-hour and 10-hour curves which we presented. Since four out of five of our conclusions (page 26) in this matter of accidents refer to the relation of consecutive hours of work in the same plant regardless of shift, and since the limited extent of this smoothing was duly ascertained, it was not thought worth while to present the shifts at the 8-hour plant separately. Such a separate presentation would involve the use of somewhat confusing shift production curves as well as shift accident curves.

In regard to the night-work curve of accident-output ratios which Dr. Ryan tabulates, this seems to me of distinctly inferior calibre to the curves presented in the Bulletin. The power consumption is not used to represent machine work production, but five isolated output curves not necessarily good samples of machine

* Dr. Ryan seems occasionally to fall into the error of supposing that the use of the accident-output ratio as a measure of fatigue necessarily involves the theory that both accidents (directly) and output (inversely) measure fatigue. This is not the case, but we have not the space here to repeat the argument fully presented in the Bulletin itself.

work in general, and the index numbers are by no means formed "in accordance with the methods used in the report," as Dr. Ryan states. Apart from technical points, it is questionable how far one can argue from a comparison of the tenth* hour of a 12-hour shift with the ninth hour of a 10-hour shift. Fatigue in the sense used in the Bulletin to include "its remoter manifestations of a psychological nature," is not a mere matter of the hours already passed, but is also likely to be modified by the thought of the continuous hours of work that are coming. The investigators based no argument on the comparison of the seventh hourly ratio at the 10-hour plant with the eighth hourly ratio at the 8-hour plant (however unfavorable to the former), and there is no valid reason for introducing this sort of test as between day and night work. As for factors peculiar to the last hour, it should be noted that the last hour at the 8-hour plant showed no extraordinary rise in the accident ratio; on the contrary, it showed a heavy fall.

* Owing to the twenty-minute recesses at 6 and 12 o'clock, what Dr. Ryan calls the eleventh is more strictly the tenth working hour.

Summary

In important particulars, Dr. Ryan's criticism mistakes the trend of the argument. He emphasizes relatively unimportant factors in his discussion, and in their evaluation insists on ideal perfection. It is doubtful whether the refinements which Dr. Ryan suggests would have made any material difference in the conclusions to be drawn from a comparison of the 8-hour and 10-hour systems as in operation in the two plants studied.

The authors of the Bulletin did not underrate the need for a complete examination of all possible points in question. But such complete perfection, it should be remembered, is impossible without (1) much greater willingness on the part of employers to experiment with different lengths of working periods under scientific control, and (2) a great advance in the theory of industrial physiology.

BOOK REVIEWS

The Industrial Clinic: A Handbook Dealing with Health in Work. Edited by Edgar L. Collis, M.D. Oxon., M.R.C.P., Talbot Professor of Preventive Medicine in the University of Wales; Late Director of Welfare and Health, Ministry of Munitions, and H. M. Medical Inspector of Factories. Cloth. Pp. 239 with illustrations, appendix, and index. London: John Bale, Sons & Danielsson, Ltd., 1920.

In this small book, Dr. Collis has brought together excellent discussions of many phases of industrial medical practice. There are briefly but comprehensively presented the problems of the medical examination of the worker, the selection and placement of the worker, the relations of industrial efficiency and fatigue, the hygiene of working conditions, of the individual, of food values in relation to occupation, of canteen service and of first-aid administration.

Although the several contributors have based their observations for the most part upon British experience, there is sufficient similarity between industrial conditions in the United States and in Great Britain for many of the authors' recommendations to be readily applicable.

The book should be of value to industrial and mercantile physicians and nurses as well as to executives of industrial establishments. — *Wade Wright.*

ANNUAL CONFERENCE OF THE MASSACHUSETTS SOCIETY FOR MENTAL HYGIENE

The Human Element in Industry will be the general subject of the coming Annual Conference of the Massachusetts Society for Mental Hygiene, which is to be held in Ford Hall, Boston, Mass., on Thursday evening, April 7, 1921, at 8 o'clock.

Dr. Wade Wright, Secretary of the Division of Industrial Hygiene, Harvard Medical School, will speak on *Industrial Hygiene;* Dr. C. Macfie Campbell, Director of the Boston Psychopathic Hospital, will discuss the *Mental Health of the Industrial Worker;* and Mr. Boyd Fisher will present the *Personnel Problem in Industry.*

The public is cordially invited.

SUBJECT INDEX TO VOLUME II

This is a subject index to all the reading matter in the JOURNAL OF INDUSTRIAL HYGIENE and one should, therefore, look for the subject word, with the following exception: "Book Notices" are indexed under this title on page 489. The name of the author follows the subject entry in parentheses.

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GENERAL

DEFECTS FOUND IN DRAFTED MEN, II. *C. B. Davenport* and *A. G. Love.* Scientific Monthly, Feb., 1920, 10, No. 2, 125–141. — This article is the second installment of an analytical study of the statistics of the medical examinations of drafted men. There are fourteen maps showing the distribution throughout the country of diseases of the eye, heart, varicose veins, tonsillitis, asthma, epilepsy, mental diseases, mental deficiency, and defects of the teeth. The distribution of total defects and diseases in the states is also exhibited. There appear to be two great centers of defect, one in the northeastern part of the United States, and the other including especially the states on the Pacific Coast and the two mountain states, Wyoming and Colorado. Rhode Island has the highest defect rate of all the states, flatfoot and hernia being especially frequent. Here also many minor defects reach nearly the maximum ratio. The authors explain this as due to the defectiveness or nonresistance of the stock which has been drawn to the state for manufacturing pursuits. The defects are not to be ascribed to the occupation itself, but to the fact that the occupation, being relatively low-grade and ill-paid, has attracted a stock with inherent defects or susceptibility to disease. Next to Rhode Island comes Vermont, probably on account of the presence of a large number of French Canadians, in whom the defect rate is particularly high. The third state is Virginia, suffering

from its age and its consanguineous matings, and in part from the nature of its colored population. At the bottom of the list is Kansas, with only about half the defect rate of Rhode Island. South Dakota, Nebraska, Kentucky, and Arkansas (prevailingly white agricultural states) also stand low.

The data have been computed also with reference to racial and to occupational distribution. Clerical work produces myopia; standing in shops and walking on pavements in tight shoes accounts for many of the bad feet of city people. The eastern manufacturing group is characterized by an excess of myopia, valvular diseases of the heart, speech defect, bad teeth, and underweight. The group containing a large proportion of mining population is characterized by a high rate of venereal diseases and by much tonsillitis. The point is emphasized that the figures do not indicate merely the effect of conditions upon physique, but are largely controlled by the constitution of the populations which have selected different regions for homes and the different occupations prevailing in the regions. Comparing rural and urban districts, the statistics show a higher rate of defects in the cities in a proportion of 609 to 528. The higher fate in the cities is determined, however, by the prevalence of flatfoot. In general, the urban districts exceed in defects due to inferior stock and bad environmental conditions; the rural districts exceed in hereditary congenital defects. From a military point of view, the Northwest contains the best men of the country. — G. E. Partridge.

What is the American Standard of Living? *Royal Meeker.* Mod. Med., July, 1919, 1, No. 3, 193–199. — "From this very brief analysis of the data thus far worked up from the cost of living schedules it is very apparent that there is no such thing as the American standard of living in the sense of a very superior standard giving all the necessities, many of the comforts and a goodly supply of the luxuries of life. On the contrary it is found that there are as many different standards as there are different incomes and families of different sizes. In the lower income groups the living conditions are hard indeed. The incomes of the lower-paid workers must be increased and the cost of food, clothing, and housing must be lowered to enable these families to meet the high costs of existence. Social legislation is needed to give them better and cheaper food, clothing, houses, medical treatment, and insurance. Even in the higher income groups conditions are not as easy as they are frequently pictured to us. Let us not be fooled by the cry that the American standard of living is the highest in the world. Let the minimum living standard in America be one that will support life in decency and health." — C. K. Drinker.

Human Engineering — A New Medical Specialty. *Frank L. Rector.* U. S. Pub. Health Ser., Pub. Health Rep., Jan. 9, 1920, 35, No. 2, 61–65. — The duties of the industrial physician today must cover such a wide field of service that it would be somewhat more appropriate were he designated as the human engineer. He must be able to interpret industrial processes, understand the operation of mechanical appliances, size up the human requirements for filling a certain job, make scientific studies of the hazards of occupations, make certain that proper working conditions are provided for the industrial population, and interpret these findings in terms of increased production, decreased labor turnover, and healthier and happier workers. He should also be able to tune up the home, community and industrial environment so that each would bear its part of carrying forward the great commercial life of the nation. He comes into intimate contact with four departments of industry, namely, employment, safety, medicine and welfare. If he is fulfilling the obligations of his position, he must know intimately and well the workings of each branch of this group. By making a physical examination of applicants for employment, he exerts a direct influence upon the placing of workers. If he properly follows up accidents, he comes in contact with the safety department. Of course, he dominates the medical department and, if he has the proper interest in the worker away from his factory job, he must be familiar with what is being done in the home and community environment of the workman. — L. A. Shaw.

Opportunities for Industrial Surgeons. *R. M. Little.* Mod. Med., June, 1919, 1, No. 2, 118–121. — Three influences are making increased opportunities for industrial surgeons: (1) the growing intelligence and deep concern of employers for the health and well-being of their employees; (2) the compensation laws; (3) growing appreciation of the economic value

of health. No facts accompany the very general discussion of these points. — C. K. Drinker.

Education in Industrial Medicine. *Otto P. Geier.* Mod. Med., June, 1919, 1, No. 2, 133–136. — A brief statement of a proposed plan for instruction in industrial medicine in the University of Cincinnati. — C. K. Drinker.

New Developments in Industrial Medicine and its Future. *Harry E. Mock.* Mod. Med., July, 1919, 1, No. 3, 203–208. — A general statement giving the position of industrial medicine and indicating its probable future. — C. K. Drinker.

The Development of the State Departments of Health in Relation to Health Insurance and Industrial Hygiene. *Augustus B. Wadsworth.* Am. Jour. Pub. Health, Jan., 1920, 10, No. 1, 53–58. — Preventive medicine has developed so rapidly that it has greatly enlarged its scope in the conservation of the health of the community. Despite this wonderful development, preventive medicine has nevertheless progressed in a comparatively narrow field — the control of the infectious diseases. The infectious diseases are but a part and, from the economic point of view, a comparatively small part of preventable human sickness and disease. The diseases of adult life, constitutional diseases resulting from cardiac, renal and digestive disorders, cancers of all kinds, the occupational diseases, etc., are all to an extent preventable.

The three major functions of all public health work are regulation, education, and personal or community service. Chief of these is the personal or community service, but if this is to be made effective all three functions must be fully developed and carefully co-ordinated. Health insurance, as it has been tried in different countries, is generally recognized as a failure. It provides an unsatisfactory service for its beneficiaries, and is subject to abuses. It does not tend to increase the efficiency of the medical service which is rendered to its beneficiaries. In industrial medicine, however, conditions are quite different. Large industrial organizations employ physicians who are responsible for their work and who are well trained in it. The labor organizations have also caught the spirit of the times and many of them have their own corps of experts who are entering this field of preventive medicine. The scope of the service of such organization in preventive medicine might very easily be greatly extended with the co-operation of the state departments of health. The economic value of such work has been fully established. But this plan of industrial medicine fails to provide for the greater number of all employees who work in smaller places, nor is there any immediate prospect of securing such a well-organized medical service for all of the people, save through the agency and the development of the state organizations that already exist, mainly the departments of health. The state department of health provides a central nucleus from which educational and other necessary work can be organized and operated in the state through branch or local centers. Laboratories form excellent centers from which to reach and serve physicians of a district. By similarly co-operating with the institutions and hospitals of the district and also with all of the physicians engaged in industrial medicine in the district, such a center would tend to organize and standardize the work and to increase through broader and larger experience not only its own efficiency, but also the efficiency of every physician in the district.

In order to accomplish the best results, however, competent experts must be induced to enter the state service. Adequate salaries should be appropriated so that the state can secure the best talent, because it requires considerable additional experience and specialization in state work to appreciate the problems. Health departments, if they are to discharge properly their duties to the citizens, must maintain their work on the highest planes. They must have experts in every branch who are unquestionably competent. The full development of preventive medicine, if it is to be a part of public health work, must follow lines of investigation and research with a corps of trained experts in each branch of medicine. — H. F. Smyth.

The Increasing Socialization of Medicine. *Arthur Newsholme.* Survey, Jan. 3, 1920, 43, No. 10, 357–362. — The writer points out some of the important features of the development of socialized medicine in England. He calls attention to what has already been done along the lines of sanitation, and the treatment and segregation of contagious diseases by public and semi-public agencies.

Although the number of hospital beds in England is 4.9 per 1000 of population, this

hospital service is not properly distributed. The prevalence of hospitals in the larger communities has tended to bring urban and rural death rates to nearly the same level in spite of many factors which tend to make urban communities less healthful.

In outlining the public medical service at present provided for in England, the writer enumerates the following:

1. Medical attendance for destitute persons.
2. Institutional treatment of lunacy.
3. Increasing facilities for treatment of feebleminded.
4. A large amount of gratuitous treatment of infectious diseases.
5. Under the National Insurance Act a marked extension of sanatorium and hospital facilities for treatment of tuberculosis.
6. Special assistance through local agents in aid of maternity and child welfare.
7. Special facilities for diagnosis and treatment of venereal diseases made obligatory with larger local authorities.
8. Assistance to medical practitioners in bacteriological diagnosis, etc.
9. Medical examination of school children.

In concluding it is pointed out that "the state will year by year take an increasing hand in medical matters." Medical service will become more and more closely identified with the individual needs of communities. The hospital and dispensary will become educational centers as well as treatment centers. In order that this may be accomplished fully in the course of time, medical practitioners must be developed who will look upon problems of personal and community hygiene as seriously as they do upon the accepted medical practice of the present. — C. H. Paull.

Labor and Production. *H. B. Drury.* American Federationist, March, 1920, 27, No. 3, 237–244. — Work in the present stage is full of conflict, and most men find but little intrinsic interest in their occupations. What we need is to infuse into industry the spirit of co-operation. The whole modern labor movement in its origin and in its fundamental tendencies is a reaction against the mechanical and the merely profit-making aspects of industry. The basic needs of labor at the present time are: more efficient and abundant production of material goods, for which wide co-ordination is necessary; conditions that will preclude the possibility of work being physically, mentally, and morally destructive; proper sharing, on the part of labor, in the goods produced. Labor has been inclined to assume that production is of interest only to the employer. This attitude needs to be changed. All measures and every kind of organization that will tend to increase productivity are now demanded urgently. Why should not the field of industry be freed from friction and suspicion and become throughout devoted to achievement? — G. E. Partridge.

Vocational Guidance and the Theory of Probability. *H. D. Kitson.* The School Review, Feb., 1920, 28, No. 2, 143–150. — Although we have not found ways of selecting an occupation for the individual, we have developed methods for the selection of the individual for an occupation, with results so encouraging that investigators are inclined to neglect the older field and to minimize its possibilities. Quantitative statements in vocational guidance must be couched in terms of probability. Only thus can a scientific mode of procedure be developed. We need data of many kinds, for example, in regard to probability of income of trades and professions. By the aid of vocational tests we must calculate the chances of success of the individual in a given occupation. We must measure applicants with the tests for which we have secured norms from records of workers. Knowing the test score of the individual under consideration and knowing the chances that an individual standing in one percentile in the tests will stand in the corresponding percentile on a scale of occupational success, we shall be able to state in terms of probability the chances that the individual will stand in a given position in the occupation, so far as his ability is concerned. Along these lines, the use of scientific methods in vocational guidance is a realizable idea. It requires only a shift of emphasis from the needs of the employer to those of the individual, and the presentation of quantities in terms of probability. Much material for use in vocational guidance is already available, such as the publications of the U. S. Bureau of Labor, about physical measurements, wage scales, occupational risks and the like. — G. E. Partridge.

Vocational Guidance and Scholarship. *Jessie Hutsinpillar.* School and Society, Jan. 31, 1920, 11, No. 266, 125–129. — "Precisely,

my proposal is this: A vocational counsellor is to recommend promising children who, if unaided, could not, in reason, secure further training, for scanty maintenance scholarships from the federal government while in training for callings useful to society. . . . Mental tests are to be used in determining eligibility, rather than competitive examinations. He (the counsellor) is to be on the alert for aptitudes in the rarer callings. . . ." — G. E. Partridge.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

MENTAL

THE MENTAL HYGIENE OF INDUSTRY. *E. E. Southard.* Ind. Management, Feb., 1920, 59, No. 2, 100–106. — Although the idea of a mental hygiene of industry is relatively new, Dr. Southard has pointed out that in fact there is (1) a psychology of industry, (2) a psychiatry of industry, and (3) a field of psychiatric social work in industry. The personnel work of psychologists during the war has demonstrated over a broad field the value of scientific selection, while similar work in individual plants has shown the value of such procedure in industry. The psychiatrist in most cases has come to industry from the outside. It is pointed out, however, that the work done up to the present time warrants industrial concerns in including a psychiatrist on their regular staff. He would be of value in co-operating with the employment department, both in the selection and placement of new workers, and in the relocation and promotion of those already employed. He could be called upon to give advice and supervise treatment in the cases of employees who were temporarily in need of special attention.

Quoting from the studies of Dr. Herman Adler, the writer has pointed out that the problem of obtaining and retaining employment is often particularly serious in the cases of "individuals in the community who, for various reasons, are not able to regulate their conduct on the basis of experience." Although some of these persons are obviously institutional cases, others are capable of supporting themselves when placed properly with regard to environment and occupation.

Attention is called to evidence which points to the possibility that the types of labor which respond most readily to the leading of labor agitators are men who have departed from normal from a nervous or mental standpoint. On the other hand, the leaders in labor unrest would seem to grade high in intelligence.

Among the important points to which attention is called in the summary of this article are:

1. The "term mental hygiene is coming into general use to cover the expert activities of psychiatrists, . . . psychologists, . . . and various non-professional or semi-professional aides."

2. Industry is becoming more keenly interested in mental hygiene, as the study of personnel problems becomes more minute.

3. War experience has furnished very strong arguments in support of the value of mental hygiene in other fields.

4. The problems of human relations can be satisfactorily solved only when all agencies co-operate. This would bring together engineering, medical, psychological, and sociological experience.

5. Care must be taken not to accept the verdict of reactionaries as based upon experience. — C. H. Paull.

THE PRESENT STATUS OF THE PROBLEM OF TRAUMATIC NEUROSES. *Th. van Schelven.* Nederl. Tijdschr. v. Geneesk., Nov. 29, 1919, 63, 2d half, No. 22, 1703–1718. — This is a fifteen-page article based on the examination of 4000 Austro-Hungarian soldiers, the summary of which is as follows:

1. The term "traumatic neurosis" is inexact, since the neurosis is not caused by the physical trauma as such, but by the psychic reaction of the patient before, at the time of, or after the injury. At best one can speak of a psychic trauma as its cause.

2. Traumatic neuroses are curable when the symptoms are not yet fixed; they usually become fixed if not cured by suggestion.

3. The usual type of patient with a traumatic neurosis is generally well oriented as to his case and consciously tries to put through his desires.

4. The complaints of all sufferers from neuroses disappear as soon as a firm, unalterable

decision is arrived at, irrespective of how this turns out; they then get well anywhere up to two years, usually earlier.

5. The best form of pension for these patients is a not too high, gradually decreasing disbursement, which is to cease at the end of two years, without the possibility of an appeal on this decision. The physician must not, therefore, lightly assume responsibility when he makes this diagnosis. — N. C. Foot.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

Coal-Mine Gases. Federal Board for Vocational Education. Bull. No. 39, Oct., 1919, 36.—This bulletin affords a practical knowledge of the fundamental facts of coal mining which it is necessary that miners should know for their own safety and for that of their fellow-workers. It is by no means a complete treatise on the subject, but is intended to present in a simple and easily understood manner the elementary facts regarding mine gases. — L. A. Shaw.

The Disinfecting Power of HCN. *Emil v. Skramlik.* Centralbl. f. Bakteriol., 1te Abt., Orig., 1919, 83, 387. — It is emphasized that the process of vermin extermination must be considered as distinct from disinfection; each of these procedures is based on entirely different principles. Bacteria are similar to members of the plant kingdom in their resistance to HCN. This gas kills some organisms, but has only a retarding effect on others. As a germicide, it appears to be at least eighty-five times as weak as HCl. — Barnett Cohen.

Poisoning by Hydrocyanic Acid Gas, with Special Reference to its Effect on the Brain. *Samuel W. Lambert.* Neurological Bulletin, March, 1919, 11, No. 93. Reviewed in Arch. Neurol. and Psychiat., Dec., 1919, 2, No. 6, 710–711. — An Italian disinfector was found unconscious in a room filled with hydrocyanic acid gas. The immediate symptoms were stertorous breathing, flushed skin, engorged and red veins, contracted pupils and rigid muscles. Later there was free sweating and muscular twitching. The man lived for sixteen days after the poisoning, showing rigid muscles, occasional convulsions, sweating, fever, tremor, ataxia and aphasia. Autopsy showed nephritis, adherent meninges and multiple small cerebral hemorrhages. Microscopically the Betz cells showed cloudy swelling, the Purkinje cells had largely disappeared, and there was gliosis in the pontal lobes. — S. Cobb.

Lead Poisoning — A Brief on the Symptoms, Diagnosis, and Treatment. *R. P. Albaugh.* Mod. Med., June, 1919, 1, No. 2, 137–138.—A concise summary of the effects of lead. — C. K. Drinker.

Lead Poisoning as a Factor in Chronic Disability. *E. B. Starr.* Ohio Pub. Health Jour., Oct., 1919, 10, No. 10, 384–386. — Lead poisoning is the most thoroughly studied and the commonest of all occupational poisonings. Dr. Alice Hamilton found seventy industries in Illinois to which lead poisoning could be traced. There is practically no industry in which lead is not used at some time. Tables are here appended showing the influence of length of exposure and the influence of especially hazardous processes.

By far the great majority of occupational diseases are of chronic nature and are seldom diagnosed as such. If industrial workers are to receive the best medical services, the doctor will need to take more interest in the occupational phase of his patient's life than is ordinarily manifested. He must inquire in every obscure chronic case concerning the hours of labor and the amount of sleep, the particular process involved in the patient's work, what materials enter into the process, the length of employment and exposure to hazards, whether the work place is overcrowded, underlighted or insufficiently ventilated, etc. Every practicing physician should provide himself with some standard work to which he can refer, as occasion demands, for information which will give him an understanding of these subjects. — L. A. Shaw.

The Share of Lead and Zinc in the Zinc Plant Sickness, with Remarks on Hygienic Measures in Zinc Plants. *Seiffert.* Öffentliche Gesundheitspflege, 1918, 3, No. 3, 85–98. Reviewed in Metall und Erz, Sept. 22, 1919, 16, No. 18, 426–428. — In zinc plants the so-called "zinc plant sickness" often occurs. It consists in a pallid appearance, loss of weight, failing strength, stomach and bowel troubles, nervousness, bluish tint of the gums, pains in the joints; often paralysis and muscular de-

generation, etc., also occur. But all these symptoms do not occur together in every case. Lead, to the poisonous effect of which the zinc worker is constantly exposed, has a prominent part in the origin of the sickness; but it is not the only cause of the sickness, as has been generally assumed till very recently. The "Councillor of Hygiene," Dr. Seiffert, proves in his lengthy treatise that other metallic poisons besides lead are responsible for the sickness, especially zinc, which has been generally considered harmless. The majority of the symptoms of chronic poisoning, which were formerly only known to be due to lead, have now been detected in the case of other heavy metals. Seiffert found zinc even more frequently than lead in the urine of sixty-nine sick workmen whom he examined. Forty of these workmen (58 per cent.) proved to have metals in their urine; 25 (36.2 per cent.) had zinc only; 2 (2.9 per cent.) had lead only; 13 (18.8 per cent.) had both zinc and lead. Thus 38, or 55 per cent., had zinc, and 15, or 21.7 per cent., had lead. There were only two cases among those in which lead was detected in the urine, in which lead poisoning was *certainly* present; there was only one case among the fifteen in which the general symptoms of chronic illness were especially prominent and severe. In severe cases, it was exceptional for lead to be excreted; but it is not to be assumed that the body retains the lead in these cases, and easily expels it in the others. Zinc is superior to lead not only in the number of cases, but also in the quantity of the metal found in the urine. Disregarding the cases in which the quantity of metal excreted was too minute to weigh, there was on an average 3 mg. of zinc per liter of urine, but only 0.16 mg. of lead. Seiffert rejects the objection that small quantities of lead can have a more dangerous effect than large quantities of zinc; he rather thinks that the human body has a great power of tolerating or resisting lead. Among other facts, the rarity of lead poisoning among typesetters constantly exposed to lead proves this.

In those zinc plants with which Seiffert is personally acquainted, metallic lead is absorbed almost entirely by way of the stomach and the bowels; even the lead salts which are insoluble in water do not penetrate the body in any other way. But in such a case the organism soon frees itself of most of the poison, which is transformed to lead sulphide — considered non-poisonous — in the bowels, and is then rejected again unchanged in the excrement. In and around the zinc plants this process should be facilitated by the considerable quantities of sulphur dioxide present in the air. However, when lead is constantly present in the stomach and bowels part is absorbed under conditions which are still unknown; this, as well as the soluble poison introduced with food and drink and that breathed in by the lungs in the form of lead fumes, gets into the blood. The portion of this lead not excreted again either by the gall-bladder into the bowels, or by the kidneys into the bladder, or by the skin to the surface of the body, is brought by the circulating blood into all the organs of the body, where it can exercise its destructive effects. Also, deposits of lead are formed in various organs, from which renewed destruction of tissue spreads. So it happens that alterations and lesions of organs do not appear at once with symptoms of poisoning; the alterations and lesions cause only a general and gradually increasing sickness. The storage organs of the body operate as lead filters and prevent the bodily fluids (and mainly the blood) from being over-filled with the metallic poison. A surplus of lead in the blood, with its dangerous consequences for the red corpuscles, only occurs when these storage organs are insufficient, fail to act, or are over-filled. The varying power of resistance to lead poisoning, found among workmen, may be due to more or less efficient functioning of these storage organs, as well as to the greater power of resistance of the cells. Otherwise it is inexplicable that in many workmen severe symptoms of illness occur after brief employment, in others only after many years; also, that the objective symptoms of lead poisoning are extremely inconsistent and variable in different workmen, and may be either mild or very severe. The general constitution and way of living also are certainly factors in this matter.

Zinc is absorbed into the body in the form of gas and dust. Up to the present, the absorption of the vapors alone was considered dangerous; however, injurious effects which can be attributed to nothing but zinc, have been observed in workmen who have not been exposed to zinc vapors. The injuries due to zinc vapors occur only immediately at the ovens and in smelting; they only affect special classes of workmen, who are in fact more often poisoned than the others (smelters, and those engaged in the actual tending of the muffle furnaces). The fact that their injuries are not still more exten-

sive and severe is due to the considerable supply of atmospheric oxygen present, as well as to the cooling and resulting low density of the gases; the zinc solidifies on its way to the lung tissue, and can be expelled from the lungs (which have little power to absorb it) by coughing.

Seiffert regards the zinc which gets into the body in the form of dust as the chief enemy which constantly harms the zinc worker. The constant, though slight, absorption produces the sickness gradually. Most of the injurious effects are due to the dust from blende and calomine, with its great quantities of zinc sulphate and carbonate. The former is soluble in water, the latter in dilute acids. Zinc-albumen compounds are formed which penetrate the blood without difficulty.

The tolerance of the organism for zinc is likewise great, certainly greater than its tolerance for lead. Comparatively great quantities of zinc can be excreted for a long time from the kidneys and other organs, without affecting even temporarily the ability to work. Seiffert gives many examples which show that the deposits of zinc in the body are often very large, and yet threaten no immediate danger to life. The storage organs do not become insufficient and the system does not become poisoned till the collections of metal have become too large; this had occurred in most of those cases in which a considerable excretion of zinc could be detected in the urine.

The picture of zinc plant sickness is not unified. In one group of patients stomach and bowel troubles are prominent; in another, nervous troubles; and in still others, pains in the kidneys or joints or back. The symptoms are generally mixed. The explanation of this is that the resisting power of the various organs varies from person to person; varying age, the unequal effect of cleanliness, dwelling conditions, nutrition, etc., are also important factors. Seiffert's remarks show that it is necessary to protect the workman still more; the injurious effects of zinc must be prevented, as well as those of lead; the effect of arsenic, antimony, copper and gases (carbon monoxide, sulphur dioxide) must also be considered. The regulations of the Bundesrat (German Federal Council) of Feb. 6, 1900, and the later additional regulations have resulted in a marked improvement in the hygienic conditions in upper Silesia, as these measures compelled the modernizing of the plants. Still, many more things must be done to diminish the existing danger to health.

Note by the editor of Metall und Erz. — "We are very sceptical of Seiffert's theory that zinc, as well as lead, poisons the workers in zinc plants. To prevent any alarm in the zinc industry which might be caused by Seiffert's contentions, we have communicated with the Institute for Industrial Hygiene. This Institute, with the Department of Health, will settle the matter." — J. A. Singmaster.

Hygienic Control of the Anilin Dye Industry in Europe. *Alice Hamilton.* U. S. Bur. Labor Statis., Month. Labor Rev., Dec., 1919, 9, No. 6, 1–21. — This report is the result of studies made, at the request of the Commissioner of Labor Statistics, of representative dye plants in France, Switzerland, Germany, and England during the spring and summer of 1919. The purpose was to see what measures are taken in these countries to protect workers against the dangers of industrial poisoning. America's dependence upon Europe for a knowledge of the poisonous effects of dyes is emphasized. (For the essential features of poisonings resulting from the manufacture of dyes, see the author's article in the Monthly Labor Review for February, 1919.) The following toxic substances are briefly discussed as observed in use in European plants, and a number of interesting and illustrative case histories are included: benzene (C_6H_6); anilin ($C_6H_5NH_2$); chlorbenzenes; miscellaneous compounds of the benzene ring; dinitrophenol ($C_6H_3HO(NO_2)_2$); dimethyl sulphate ($(CH_3)_2SO_4$); phosgene or carbonyl chloride ($COCl_2$); chromates; hydrogen arsenide (AsH_3).

Sections follow on *The Methods of Prevention of Occupational Poisoning; Attention to Feeding Employees; Wash Rooms and Working Clothes; Medical Supervision.* — R. B. Crain.

A Report of Five Cases of Poisoning by Nicotine. *William D. McNally.* Jour. Lab. and Clin. Med., Jan., 1920, 5, No. 4, 213–217. — After reviewing the literature, McNally reports five cases of poisoning by nicotine. In all cases death occurred from having taken by mistake insecticides containing nicotine. The free alkaloid is a colorless, oily liquid which rapidly becomes brown in color, closely resembling whiskey, which accounts for its accidental consumption. Three of the cases occurred in men employed in greenhouses. In all cases, death resulted within a few minutes. — H. A. Bulger.

DUST HAZARDS AND THEIR EFFECTS

REMOVAL OF DUST, FUMES AND GASES FROM FACTORY WORKROOMS. *Robert Northrup.* Safety Engin., Jan., 1920, 39, No. 1, 18–23. — An article dealing with the procedure used by the New York State Industrial Commission when an order is issued to remove excess dust, fumes and gases. By this procedure a great gain in the efficiency of exhaust work has been accomplished, and the manufacturer is assured that his investment in dust removal apparatus will result in the required efficiency. — R. Thomson.

DUST EXHAUST SYSTEM AT ARIZONA COPPER CO. MILL. *R. M. Hull.* Chem. and Metall. Engin., Feb. 4, 1920, 22, No. 5, 207–208. — The dust exhaust system, installed for the purpose of improving the working conditions in the plant, is described. The amount of dust collected in a series of tests equaled 0.087 tons, or 0.0367 per cent. of the ore crushed. — G. M. Fair.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

TUBERCULOSIS — A CITY PLAN. *C. V. Craster.* Jour. Am. Med. Assn., Jan. 31, 1920, 74, No. 5, 302–306. — Despite previous knowledge regarding tuberculosis, the mortality, although decreasing, is still too large. The prevalence of the disease has continued and so far we have failed to control it. The following city plan for tuberculosis control is suggested:

A. Control of infection by (1) requiring reports from physicians, hospitals, sanatoriums, day camps and tents, and field nurses; (2) enforcement of anti-spitting laws; and (3) milk supervision.

B. Social progress by (1) publicity; (2) social insurance; (3) anti-tuberculosis societies program; and (4) home visiting and relief.

C. Economic improvement through (1) improved housing; (2) industrial hygiene; (3) open air schools; (4) vocational training; and (5) employment bureaus.

D. Associated activities including (1) control of epidemics (measles, whooping cough, etc.); (2) convalescent homes; (3) child hygiene; and (4) mental hygiene. — W. Herman.

INFLUENZA — WHEN THE CITY IS A GREAT FIELD HOSPITAL. *Lillian D. Wald.* Survey, Feb. 14, 1920, 43, No. 16, 579–581. — The title of this article seems to be unfortunately chosen, in view of the fact that the article deals with the organization of a centralized type of community health service, which is of interest primarily not because of the need which called it into existence, but because of the effectiveness with which it continues to function. With the breaking out of the influenza epidemic in the fall of 1918, the Nurses' Emergency Council was created. The necessity for a community organization was emphasized not only by the epidemic, but also by the scarcity of nurses.

Within twenty-four hours, this emergency council had so successfully drawn its forces together that it was ready to function. Through its activities it was able to co-ordinate work in the various city districts which it established. The work of the limited number of available nurses was supplemented by volunteers who had little or no special training.

At the request of the commissioner of health, the Nurses' Emergency Council has become a permanent organization. Its work has developed so that in the case of the influenza epidemic of this year it was able without increased organization to extend its service through the various agencies which it includes. In spite of the excellent work which this body has accomplished, its activities have been limited by the number of nurses and the amount of funds available. Its work, however, has demonstrated the practical value and effectiveness of this form of centrally organized community service. — C. H. Paull.

PULMONARY ANTHRAX: REPORT OF A CASE. *W. R. Brooksher, Jr.* and *J. A. Briggs.* Jour. Am. Med. Assn., Jan. 31, 1920, 74, No. 5, 323–324. — The authors report a case of pulmonary anthrax in a tannery worker who had been handling green hides. The diagnosis depended rather on the notation of subjective than on the

elicitation of objective signs. The following conclusions are given:

1. Diagnosis of pulmonary anthrax is only possible in positive laboratory findings; sputum examinations and blood cultures are the means employed.

2. Early diagnosis and treatment with anti-anthrax serum by intravenous injection offers the only hope of recovery.

3. Pulmonary anthrax may appear without the evidences of a violent pneumonia and yet prove fatal as a result of a decided clinical toxemia. — W. Herman.

Observations Based on Feces Examinations on the Occurrence of Intestinal Parasites in Troops and War Prisoners. *R. Vogel.* Centralbl. f. Bakteriol., 1te Abt., Orig., 1919, 83, 486. — One hundred examinations in a regiment that had fought on the western, eastern and southern German fronts showed 75 per cent. infected with intestinal worms. There were 63 per cent. with Ascaris lumbricoides, 41 per cent. with Trichocephalus dispar (29 per cent. had a mixed infection of both the above parasites), and 3 per cent. also contained Tenia in addition to the others. Fifty examinations were made on a company of bakers on the western front. Of these, 66 per cent. were infected. Thirty per cent. had Ascaris, 60 per cent. Trichocephalus, and 30 per cent. had a mixed infection of these two worms. Fifty-six examinations on Russian prisoners showed 50 per cent. infected. There were 50 per cent. of these with Trichocephalus and 14 per cent. with Ascaris. One of the striking results of this study was the complete absence of Oxyuris in any of the groups. — Barnett Cohen.

Occurrence and Number of Worm Eggs in Stools as Observed in the Wounded, Sick and Attendants of a Field Hospital. *Albert Gmelin.* Centralbl. f. Bakteriol., 1te Abt., Orig., 1919, 83, 460. — Crowding greatly facilitates the spread of intestinal worm infection in adults as well as in children. Trichocephalus dispar was most prevalent, occurring in 18.5 per cent. of the cases, while next in order came Oxyuris vermicularis with a frequency of 18.4 per cent. Ascaris was present in 12 per cent. of the cases, Tenias in 2.4 per cent., and aguillula intestinalis in 1.8 per cent. From the epidemiological standpoint, it is important to note that field bakers had a higher percentage of infection, though resulting serious clinical disturbances were not observed in them. — Barnett Cohen.

The Municipality's Share in Preventing Venereal Disease. *George W. Goler.* Nat. Munic. Rev., Feb., 1920, 9, No. 2, 74–77. — Among the statistical material introduced in this article to call attention to the seriousness of venereal disease may be noted:

1. "Of 25,633 cases of infectious diseases reported in New York City, 28 per cent. were syphilis."

2. "From 4 to 15 per cent. of insane in state hospitals or institutions for the insane are there because of syphilis."

3. Careful investigation has established the belief that 10 per cent. of marriages involve a syphilitic individual.

The danger of syphilis lies not only in the disease as it is commonly recognized, but also in diseases of the heart, kidney, and liver. The effects of venereal diseases in parents are particularly obvious in the large number of deaths of infants, before, at, and just after birth.

Among the functions of the municipality in combating venereal disease, the writer suggests:

1. Suppression of all forms of prostitution.

2. Provision for the free examination of all persons before marriage and prevention of marriage in case of those affected by venereal diseases.

3. Establishment of laboratories and clinics through which physicians could work.

4. Compulsory attendance at clinics or at the office of a physician.

5. Systematic re-examination of those who have been affected with venereal diseases.

6. Ultimate provision for autopsy and laboratory study of those who die within the municipality.

The necessity for such a program as this is pointed out as having its basis in the needs of society as well as in those of the individual. The supply of population from abroad will tend to decrease, and we must place more value upon population developed in our own country. — C. H. Paull.

Statistical Study of Extragenital Chancres. *Horace W. Porter.* Arch. Dermat. and Syph., Jan., 1920, 38, N. S. 1, No. 1, 15–22. — Out of 225 patients presenting themselves with a chancre as the chief complaint, fifty-four had extragenital sores, giving the high rate of 24.5

per cent. Only nine patients were able to state the source definitely. The relative location was as follows: lips 31, tongue 6, eyelids 2, cheek 2, angle of mouth 1, nose 1, temple 1, forehead 1, tonsil 1, thumb 2, breast 2, abdomen 2, and arms 2. As in cases reported by other men, married females predominated and unmarried men ranked next. — H. A. Bulger.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

Report of a Case of Dermatitis Coccidiosa. *J. Seilin.* Med. Rec., March 1, 1919, 95, No. 9, 360–361. — Seilin reports a case of dermatitis coccidiosa occurring in a cigarmaker on the hand used for rolling the tobacco. The case was one of purely localized dermatitis for nine years, with periods of spontaneous improvement and exacerbations, and when treated by Seilin was cured promptly by local applications of 1 per cent. copper sulphate ointment and internal administration of potassium iodide with hypodermics of emetine chloride. — K. R. Drinker.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

Industrial Safety Code Conference. Jour. Am. Soc. Electrical Engineers, Jan., 1920, 39, No. 1, 79–80. — A report of the conference on industrial safety codes held at the Bureau of Standards, Washington, D. C., in December, 1919. — G. M. Fair.

Industrial Fatigue Research Board. Engin., Jan. 2, 1920, 109, No. 218. — This critical review of the Fourth Report of the Industrial Fatigue Research Board of Great Britain relating to " the incidence of industrial accidents upon individuals with special reference to multiple accidents " claims that the conclusions of the investigators are based upon concealed and incomplete classification of facts and are therefore worthless. The conclusions arrived at are that accidents do not happen according to the laws of pure chance, and also that some people are naturally more liable to meet with accidents than others. It is further considered to be proved that the victim of one accident is neither more nor less liable to meet with another as a result of his experience. — G. M. Fair.

Public Accidents and their Cost. *Frederick S. Crum.* Safety Engin., Dec., 1919, 38, No. 6, 327–328. — In a very brief paper the author calls attention to the high percentage of public accidents. From the study of occupational, home, and public accidents as well as from general knowledge and experience, it seems reasonably certain that fully one-half of all the accidental fatalities are chargeable to public accidents. To check the enormous losses of lives and property due to public accidents, however, the facts must be placed before the public in a clearer light. To this end, the committee on statistics of the National Safety Council, of which committee the author is chairman, is trying to develop a blank form for the better reporting and recording of public accidents, by means of which information may be placed before the public, the truth of which will be undeniable and the significance of which will be so startling that a much wider co-operation between the government and the public for the prevention of public accidents will result. — R. Thomson.

A Method of Safety Education. *R. A. Shaw.* Safety Engin., Dec., 1919, 38, No. 6, 341–342. — A system of safety education that has proved successful in the Ford Motor Company is outlined in this paper. A striking decrease in accidents is shown by a comparison of the months of October, 1916, and May, 1919, when there were 194 and 40 accidents respectively — a reduction of nearly 80 per cent. in three years, while the number of employees increased 18 per cent. — R. Thomson.

What Constitutes Good Inspection? *Lew R. Palmer.* Safety Engin., Dec., 1919, 38, No. 6, 323–326. — The safety inspector must not only possess tact and apt observation, but must have training and practical experience that will enable him to justify his recommendations. In many instances, the correction of unsafe and unhealthy conditions can be combined with improved operating methods pro-

vided there is close co-operation between the engineer and the safety inspector. New inspectors should become familiar with the safety standards developed by the various compensation insurance companies in co-operation with the leading industrial states. A list of the items covered in these standards is included in this article, as is also a list of safe practices pamphlets published by the National Safety Council and of safety specifications for plant construction and equipment prepared by the U. S. Shipping Board Emergency Fleet Corporation. These publications furnish the foundation from which can be developed comprehensive and practical safety recommendations. — R. Thomson.

Who Won the 12 Years' War on Accidents? *C. W. Price.* Factory, Feb. 15, 1920, 24, No. 3, 456–458. — Mr. Price, general manager of the National Safety Council, points out some of the elements of progress in accident prevention. Particularly interesting are the charts reproduced from the records of the Scovill Manufacturing Company and the Packard Motor Car Company.

Drawing upon the experience of the past, Mr. Price outlines some fundamentals of accident prevention in industry:

1. The management must be sincerely behind all safety work.

2. "One man should be made responsible for safety work in every plant."

3. Plant committees of from three to five members will aid in relieving the management of many details.

4. The attitude of the worker depends largely upon the attitude of the foremen.

5. Interest among workmen is conditioned to a degree by responsibility placed upon them.

6. In hazardous departments special committees of workers should be formed.

7. Bulletin and similar service is valuable.

8. Safety will never succeed fully until it has been carried into the community life of the workers. — C. H. Paull.

Clumsiness, a Cause of Accidents. *Val Klammer.* Safety Engin., Jan., 1920, 39, No. 1, 27–29. — In an analysis of the principal causes of clumsiness, the following reasons are given: malformation, previous injury, defective vision, poor hand and eye co-ordination, mental deficiency, disease, fatigue, excitement, mind-wandering, laziness, intemperance, inexperience, and old age. By periodic physical examinations of employees, physiological tests, and co-operation between the employment office and the safety department, the solution of the problem of putting the right man in the right place may be accomplished. — R. Thomson.

Preventing Accidents in Gas Plants. *J. F. Conner.* Safety Engin., Dec., 1919, 38, No. 6, 328–329. — Precautions in the form of sufficient ventilation and lighting, and approved lighting systems should be taken against pockets of gas accumulating in gas works. Like precautions should be taken to guard against dust explosions in coal-crusher rooms and pits where the air is heavily charged with minute particles of carbon which may ignite and explode by contact with a naked flame. In cases where a man has to work in a gas-charged atmosphere, he should be supplied with a suitable respirator and be under the observation of someone outside the danger zone. The greater number of accidents are due to simple hazards, and only by continued educational propaganda and by safety rallies is it possible to attract and maintain interest in accident prevention. — R. Thomson.

Safe Practice in Using Gas Masks. *A. C. Fieldner* and *S. H. Katz.* Safety Engin., Dec., 1919, 38, No. 6, 318–319. — The army-type gas mask, with a suitably filled canister for the gas in question, provides complete protection for both lungs and eyes. The gas mask is not, however, a cure-all for every gaseous atmosphere. It has serious limitations which should be thoroughly understood by every user. In conclusion, the authors offer some important recommendations which will aid in keeping the masks in good order and will lead to their use under proper and safe conditions. — R. Thomson.

INDUSTRIAL SURGERY

Treatment of Denervated Muscle. *Frank A. Hartman* and *W. E. Blatz.* Jour. Am. Med. Assn., March 27, 1920, 74, No. 13, 878–880. — "The sciatic or tibial nerve was cut or crushed on both sides of 123 rabbits. The denervated muscles on the right side were either massaged

(eighty-six cases) or else stimulated by galvanic shocks (thirty-seven cases), daily.

"Union of the cut nerve was prevented in forty-one animals, and in the others it was favored by suture or by crushing instead of cutting. The right and left muscle groups were compared from every ten to fourteen days by a determination of their power to do work when stimulated by supermaximal galvanic shocks while the animals were under the influence of ether.

"Neither massage nor galvanic stimulation prevented the loss in galvanic response which normally develops a few days after denervation. Treatment likewise did not appear to cause a more rapid recovery of the muscle when the nerves were permitted to grow down to the muscle fibers. Galvanic response and voluntary function in the denervated muscle returned much earlier in crushed nerve cases than in cut and sutured cases.

"In all of our work we have been unable to demonstrate benefit from massage or galvanic stimulation." — C. K. Drinker.

"Flat Foot" and Other Static Foot Troubles. *Frederic J. Cotton.* Boston Med. and Surg. Jour., Jan. 1, 1920, 182, No. 1, 1–11. — The author summarizes his article as follows:

"1. Most foot troubles are physiological — 'static' in origin.

"2. In a large share, bad shoes are responsible.

"3. In many, bad habits in use of the feet are responsible.

"4. In cases of Class 1a (habitual flat foot) decent shoes and properly supervised exercises, properly carried out, will bring about a *cure* in a very large percentage — probably a majority — of cases, certainly in a majority of the younger cases — below 25 years of age.

"5. These are the cases to which plates are too often applied.

"6. Plates are still too much used.

"7. Plates help, but never cure.

"8. 'Flat-foot' cases, as we meet them, call for either physiological cure — palliation by straps, plates, etc., then systematic exercise, or else they do ill under the routine and call for more or less permanent support — or (rather rarely) for radical correction by manipulation or by open operation.

"9. Anterior-arch troubles are readily relievable, as a rule — very often not curable.

"10. Hallux valgus (and hallux rigidus) may be palliated effectively but can be cured only by surgery." — K. R. Drinker.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

Prevention of Fatigue in Industry — I. So-Called Tests for Fatigue are of Doubtful Value. *Reynold A. Spaeth.* Ind. Management, Jan., 1920, 59, No. 1, 7–9. — This is the first of a series of articles prepared by Dr. Spaeth on fatigue. He calls attention to the fact that as yet there has been no means devised for determining when, in the case of individuals, normal fatigue (such as can be dispelled by proper sleep, food, etc.) passes over the threshold into cumulative fatigue (such as will lead to a serious pathological condition if allowed to continue). Although the body does respond to stop effort resulting in extreme fatigue, this response cannot be relied upon to take place before the limits of normal fatigue have been passed.

Partly because of its evasive qualities we have failed to look upon cumulative fatigue as one of the most serious health hazards in industry. As a health hazard the most serious characteristics of fatigue are: "(1) the difficulty of detecting it in its earlier stages; (2) the fact that a 'nervous breakdown' frequently means a permanent injury to health; (3) the fact that . . . cumulative fatigue is not well understood and neither the symptoms nor the treatment have received the attention they deserve."

Attention is called to the fallacy of relying upon production statistics as an indication of fatigue. The common idea that decline in production gives a check upon fatigue seems to be discredited by recent observation and study. In the case of some workers it is apparent that production actually increases with fatigue within certain limits. While the stimulation given by the offering of material or other incentives to work may lead to a wholly desirable increase in production, care must be taken not to induce individual workers or groups of workers to call upon their reserve store of energy.

From the standpoint of the industry, the net results of "long continued cumulative fatigue

and over stimulation are: (1) breakdown . . ., (2) loss of workers in turnover, (3) shortening of trade life." — C. H. Paull.

Prevention of Fatigue in Industry — II. Reduction of Unnecessary Fatigue. *Reynold A. Spaeth.* Ind. Management, Feb., 1920, 59, No. 2, 120–122. — Attention is called in the first paragraph of this article to the difference between normal and cumulative fatigue. Since cumulative fatigue is an outgrowth of certain conditions of normal fatigue, the obvious first point of attack upon either is through normal fatigue.

The avoidance and elimination of much of the normal fatigue in industry, when properly carried out, results in gain both to the worker and to the industry. Under ordinary conditions of work the elimination of eye strain furnishes an excellent point of departure in eliminating unnecessary fatigue elements. Another important factor in fatigue is the character of seating facilities provided. Where his work permits of his being seated for a whole or part of the day, the employee should be furnished not only with a seat, but with a seat especially adapted to his particular physical needs. Proper support should be furnished the back and the chair should permit the worker to place his feet squarely on the floor.

The question of rest periods is one which can be solved only by studying the particular needs of each job. Where nervous strain or physical exertion are continuous, the rest period is commonly advantageous, but where the worker has periodic opportunities to relax in his work, rest periods do not seem to be necessary. Where work is paid for on a piece basis, it is often necessary to demonstrate to the workers that rest periods actually react to their advantage in making production easier or in increasing it.

Attention is called to the fact that, even though production may not be increased in certain instances by rest periods, still the reaction upon the worker may be thoroughly beneficial. — C. H. Paull.

WOMEN AND CHILDREN IN INDUSTRY

The Menace of Child Labor. *Christine R. Kefauver.* Month. Bull. N. Y. City Dept. Health, Dec., 1919, 9, No. 12, 281–294. — In this article child labor is divided into six classes, each of which is treated separately. Suggestions whereby the existing regulations may be improved are offered in a résumé on page 288. The child labor laws of the state of New York and the mode of administrating them are herein summarized. — L. A. Shaw.

The Future of Boy-Work. *S. J. Gibb.* The Child, Jan., 1920, 10, No. 4, 151–155.— The writer's conclusion is that the problem of boy-work is personal and not merely economic. We must give more attention to the blind-alleys — such work as has no outlook for the individual. The ultimate cause of the modern problem of boy-work is a false conception of the status of the boy-worker. The boy-worker has lost his status as an apprentice and a pupil, and has become a wage-earner. Training, if given at all, is secondary. The problem will not approach solution until the principle of the young worker as a pupil is restored and embodied in a system adapted to present conditions. The first need is education, progressive from childhood to youth, and in later years embedded in the working life. The Education Act of 1918 supplies this need. The second need is the ordering of vocational choice and entrance upon work. The average boy does not choose his work; he lights upon it. He seeks a job, not the vocation for which he is naturally apt. Each local education authority should be compelled to establish a juvenile employment bureau for its area, and sometime before leaving school each child should visit the employment bureau for examination and advice. Each boy should be kept in sight during his early working years, and the employment bureau should be recognized as the normal means for finding or changing work up to the age of 18. Legislation controlling juvenile hours of work needs to be extended and strengthened. Conferences between employers and employed in trades and commerce should aim at determining the needs and the best means of vocational and technical training in the course of work. There must be welfare supervision for boys and girls in industry. — G. E. Partridge.

Very Bright and Feeble-Minded Children: The Study of Qualitative Differences. *C. T. Jones.* The Training School Bulletin, Dec., 1919, 16, No. 8, 137–141; Jan.,

1920, 16, No. 9, 153–164. — The study has no direct application to the measurement of intelligence of the adult subject, but is of interest because of the data on qualitative differences of intelligence which it contains. — G. E. Partridge.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

Factory Design in England. Am. Arch., Jan. 28, 1920, 117, No. 2301, 116. — An illustrated article dealing with a number of examples of factory construction in England. — G. M. Fair.

Factory Stairs and Stairways. *G. L. H. Arnold.* Am. Arch., 117, Part I, Jan. 28, 1920, No. 2301, 129–134; Part II, Feb. 4, 1920, No. 2302, 161–164. — In the multi-story factory the stairway is a detail worth much more than passing notice. Four times daily the stairs are crowded by people in a hurry. A large percentage of minor accidents, many of the serious ones, and many panics in factories happen on the stairs. A properly designed and located stairway affords not only a safe and convenient means of entrance and exit but also the handiest and most effective vantage point from which to fight fires on the upper floors. For these reasons the design of the stairway should be given a place of prime importance in the planning of factory buildings. In solving the stairway problem Mr. Arnold gives consideration to: number; location; size; type; materials; safety treads; proportions; landings; handrails; enclosures; lighting; and wear. — G. M. Fair.

Plans of the Illuminating Engineering Society for 1920. *S. E. Doane.* Electrical Rev. (Chicago), Jan. 3, 1920, 76, No. 1, 15–16. — Besides other activities it is the plan of the Illuminating Engineering Society to so broaden its educational work that all dealing with lighting may do so intelligently. — G. M. Fair.

Survey of Prevailing Conditions as to Industrial Lighting. Electrical Rev. (Chicago), 76, Part I, Jan. 24, 1920, No. 4, 139–141; Part II, Jan. 31, 1920, No. 5, 180–183; Part III, Feb. 7, 1920, No. 6, 222–227. — This article is a summary of the *Survey of Prevailing Conditions as to Industrial Lighting* made under the direction of the National Lamp Works and recorded in a volume of some 200 pages, including over fifty graphic charts. The main purpose of the survey was to obtain an accurate idea of the true status of factory lighting now prevailing in representative plants of the principal industrial sections of the country. Fifty-seven cities and towns were visited and 446 different plants inspected. The principal questions on which information was obtained were:

A. Features of identification (to provide a basis for cross analysis).
B. Equipment.
C. Specific history of last lighting changes.
D. Control of lighting business (officers or personnel).
E. Disposition toward industrial lighting (officers or personnel).
F. Observations in plant (actual condition of system).
G. General (proportion of work done under artificial light and costs).
H. Advertising influences.

Statistical material is presented in answer to each question. — G. M. Fair.

Possibilities of Industrial Lighting. *R. O. Eastman.* Electrical World, Jan. 31, 1920, 75, No. 5, 263–264. — A paper presented before the Thirteenth Annual Convention of the Illuminating Engineering Society and based upon the Industrial Lighting Survey abstracted from the Electrical Review, Vol. 76, Nos. 4, 5, 6 (see preceding abstract). Mr. Eastman presents the findings of the survey in graphical and tabular form. It is of interest to industrial hygienists that the weight assigned to improved hygienic conditions and accident prevention as a result of good lighting is 4 and 6 per cent. respectively. — G. M. Fair.

Development of Factory Lighting. *George C. Ward.* Safety Engin., Dec., 1919, 38, No. 6, 320–322. — This article deals with the work of the New York State Industrial Commission in improving the lighting of factories and mercantile establishments. The conditions to be avoided are treated under the following heads: (1) glare, (2) flickering light, (3) insufficient light, and (4) sharp contrasts. Emphasis is laid on the fact that much lower wattage

lamps, properly equipped with shades and reflectors and properly placed, will produce the same amount of foot-candle illumination on the working plane as the higher wattage lamps, hanging open, unshaded and unprotected from glare, actually produce. That accidents are undoubtedly caused by defects in illumination has been shown by insurance company records. Data collected show that in December and January the accident curve is 40 per cent. greater than the normal curve for summer daylight.

The ideal lighting system should combine general and local lighting designed to fit the needs of the particular room where it is to be used, should eliminate direct and reflected glare by proper placement and proper diffusion, should minimize the loss of light by absorption in dark walls and ceilings, should have lights so arranged that no black shadows are encountered and so that a uniform diffusion of the required intensity is spread over the entire area, and lastly, should employ local lights only where actually needed. The advantages of such a system include increased production, reduction in spoilage, increased excellence of workmanship, and better wages.—R. Thomson.

Value of Light has at last been Recognized. *Ward Harrison.* Electrical World, Jan. 17, 1920, 75, No. 3, 146–148. — During 1919 illumination has taken its place among other standard agencies for increasing production and conserving energy. While this transition from the vague to the definite is marked by the use of proper intensities of illumination, it is not equally conspicuous in the elimination of glare which, although better understood and applied, still awaits the invention of an instrument with which it can be as readily measured as light intensity. Attempts have been made to avoid the cleaning of lighting units only with questionable success. It should be realized that the maintenance of lighting systems is simple and relatively inexpensive and that it is the only means of insuring permanent satisfaction. — G. M. Fair.

Maintenance of Interior Lighting Systems. *Ward Harrison* and *J. R. Colville.* Electrical World, Jan. 24, 1920, 75, No. 4, 204–208. — Someone should always be responsible for cleaning lamps, reflectors, walls and ceilings. A case is cited where illumination was raised from 2.7 to 7 foot candles by simple expedients. Curves and tables showing the effect of dirt and dust upon the efficiency of the lighting equipment and indicating remedies are given. — G. M. Fair.

Sewage Filters from Refuse. *W. Scoullar.* Public Works, Feb. 7, 1920, 48, No. 4, 81–82. — A bank of refuse, dumped as a fill in Chester, England, was leveled off and used as a sewage filter with such success that the corporation expects to extend the use of such material. Leek, England, has been practicing the same method for sixteen years. Results of chemical analyses of the crude sewage and the effluent are given. — G. M. Fair.

Prevention of Stream Pollution by Dye and Intermediate Wastes. *E. J. Casselman.* U. S. Pub. Health Ser., Pub. Health Rep., Jan. 23, 1920, 35, No. 4, 167–185. — The investigations which were the basis of this report were carried on for the most part at the plant of the Chemical Company of America at Springfield, N. J. Investigations were made "as to properties and disposal treatment of several wastes of the dye and intermediate industries. Laboratory studies were made of the properties of toluidine waste, nitrobenzene waste, monoethyl aniline waste, dye wastes, and lagoon liquor.

"Treatments that were successful on a 300-gallon scale and that were cheaper than evaporation were found for the lagoon liquor, the monoethyl aniline wastes, and the lake-forming dye wastes; and a method of treating toluidine waste was indicated in laboratory experiments.

"Specific treatments of wastes were recommended to the Chemical Company of America, based on their proposed production schedule." — L. A. Shaw.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

Health Service — Hammermill Paper Company. *M. Harrison.* Mod. Med., June, 1919, 1, No. 2, 121–126. — A general statement of the manner of operation of the service department of the Hammermill Paper Company. The article contains one interesting figure

showing progressive accident reduction in 1916 to 1918 inclusive, incident upon the activities of the service department. — C. K. Drinker.

Health Supervision for Stockyard Workers at Armour and Company. Mod. Med., July, 1919, 1, No. 3, 209–212. — A very general statement of the work accomplished in this company. — C. K. Drinker.

Pay Gas Bills Here. *E. W. Hulet.* Factory, Feb. 15, 1920, 24, No. 3, 460–463. — This is a brief account of some of the service activities of the White Motor Company, written by the production manager. In connection with the medical service and related activities, it is pointed out that the cost per employee is relatively insignificant. "The cost per man per day for 1918, including the work of the Industrial Service Department, the cost of operating the factory hospital and the publishing of the White Book and the payment of the employees for time lost in jury service was a little less than 8 cents."

Every executive in the employ of the White Motor Company is invited to spend an hour a day in the gymnasium on company time. Not only is it felt that the physical returns warrant such a policy, but the opportunity to "play together" develops good fellowship and fosters a team spirit which is carried over into the work of the company. — C. H. Paull.

INDUSTRIAL PERSONAL AND COMMUNITY HYGIENE: HOUSING, ETC.

Old and New — Plans for the Reconstruction of French Villages. *Bruno Lasker.* Survey, Feb. 28, 1920, 43, No. 18, 643–646. — In commenting upon suggestions offered by Paul de Rutté, the writer points out that it is possible in reconstructing French houses to reconcile modern hygienic principles with traditional characteristics of building. Because of the scarcity of building materials, it will be particularly important for several years to use care in eliminating waste. Various regions will be expected to avail themselves of natural resources, so that timber regions may as far as possible build houses of wood, while other localities will use other materials to a larger extent. There will be a marked tendency toward standardization. Public building will play a greater part in community life, both architecturally and in the extent of service rendered. Mr. Rutté also favors the community house where social and cultural activities can be centered. — C. H. Paull.

INDUSTRIAL INVESTIGATIONS AND SURVEYS

Health Hazards and Afflictions of Soft Coal Miners. *Emery R. Hayhurst.* Mod. Med., June, 1919, 1, No. 2, 127–132. — This article presents data gained in a survey made during the summer of 1918. Forty-three mines employing 6072 men were visited in Ohio and fifty-six in Illinois employing 15,809 men. In addition, many mining towns were inspected and persons interviewed by a pre-arranged questionnaire, including twenty-three mining physicians in Ohio and fifty-three in Illinois. Mortality statistics were compiled principally from the records of the United Mine Workers of America at Springfield, Illinois.

A brief statement as to the character of the mines is followed by mention of the mine gases encountered in these two states. Methane is a frequent cause of explosions in Illinois and carbon monoxide is designated as troublesome in Ohio. "Many Ohio miners suffer from it because of the constant shooting which is allowed during working hours." Mine temperatures are constant, the variation in individual instances lying between 50°F. and 70°F. Humidity is high. An eight-hour day is universal, with very rare overtime. Absenteeism averages 10 per cent. per day, injuries causing 2 per cent. of the total absences.

The special health hazards of soft coal mining are listed but with the exception of dust — and no figures are given indicating either the amount of dust existing or the actual harm done by it — they are all simple instances of neglect of the principles of personal and group hygiene and are not directly attributable to mining. Poor water, lack of sewage disposal, inadequate wash and change houses — these are all matters of general hygienic interest which unfortunately attend other work than coal mining. The miner apparently suffers more from being a miner than he does from the specific job of getting out coal. — C. K. Drinker.

PROTECTING THE HEALTH OF SOFT COAL MINERS BY PREVENTION OF DISEASE. *Emery R. Hayhurst.* Mod. Med., July, 1919, 1, No. 3, 216–220. — There is little reliable data as to disease among coal miners in Illinois and Ohio. Hayhurst summarizes his impressions gained from communication with physicians in the mining district as follows:

"There is no reason for believing that the usual afflictions, aside from the respiratory system and the musculo-osseous system, are more frequent among miners than among other employees. In fact, as a class, they are probably healthier than the average type of factory worker. Top workers, exposed to the weather, are said to have more sickness than those in the mine. Sickness is much more rampant among the women and children in mining districts than among the men. Alcoholism is far and away the chief bane. It is said to be on the decrease, explained by one physician as due to education, the increasing cost of alcoholic drinks, their frequent bad quality, and the extension of prohibition. Of the respiratory afflictions, chronic bronchitis associated with asthmatic symptoms, and often complicated by a chronic form of tuberculosis, is undoubtedly more prevalent than among agriculturists."

The health needs of soft coal miners are made clear in twelve recommendations with which the article closes.

" 1. There should be a housing survey.

" 2. There should be a medical service survey.

" 3. More aid should be extended to the respective state mining departments, particularly in the nature of hygienists' services.

" 4. There should be a standardization of the many existing forms of health insurance which now prevail.

" 5. All employees should be required to carry health insurance and optional membership done away with.

" 6. More Americanization is necessary in foreign districts.

" 7. More hospital, dispensary, nursing, and diagnostic services are required.

" 8. Physical examinations, preferably by state employment agencies, should be compulsory for employees at the time of hiring and after returning from an absence due to sickness or injury.

" 9. In any standardization of sickness insurance a free choice of physician should be allowed and remuneration placed on the merit basis, i. e., so much for a given service rendered. A large part of medical service could be fee-scheduled in much the same way as certain county medical societies at present publish their service rates.

" 10. Arrangements should be made for the services of specialists and experts, both for business management and for the insurance features, as well as for treatment services.

" 11. A certain part of all sickness insurance premiums paid should be definitely set aside to provide for the application of sanitary science, the latter to be under general supervision of the state health department.

" 12. All persons or services having to do with sanitation or medical care should be licensed as a check against unscientific methods." — C. K. Drinker.

INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS: SPECIAL TESTS IN THE SELECTION OF EMPLOYEES

EMPLOYMENT MANAGEMENT AND INDUSTRIAL MEDICINE. *Otto P. Geier.* Mod. Med., July, 1919, 1, No. 3, 213–215. — A plea for vigorous co-operation between employment manager and industrial physician to prosecute a successful campaign for health in industry. — C. K. Drinker.

THE NEED FOR AN EXAMINATION OF CERTAIN HYPOTHESES IN MENTAL TESTS. *B. Ruml.* Journal of Philosophy, Psychology and Scientific Methods, Jan. 29, 1920, 17, No. 3, 57–61. — The author maintains that, relative to the time and number of people devoted to work with mental tests, the results have been astonishingly meager in theoretical value. As reasons for this, he points out several hypotheses which he thinks open to criticism, such as, that intelligence can be measured by a linear scale, that differences in intelligence will be paralleled by differences in test performance, and that the intelligence of an individual has a static level. — G. E. Partridge.

THE NEW PSYCHOLOGICAL TESTS. *E. L. Thorndike.* Educational Review, Feb., 1920,

59, No. 2, 97–104. — The relations of psychological tests to ordinary content examinations, as adapted to determining fitness to enter college, are discussed. The writer maintains that those who have made a thorough study of the facts are in agreement in believing that a well-designed battery of psychological tests ought to have a trial on even terms with the traditional entrance examinations. — G. E. Partridge.

MALINGERING

Malingering. *Judson C. Fisher.* Safety Engin., Dec., 1919, 38, No. 6, 342–344. — A system to lessen malingering could be used as follows: When an employee reports ill or injured, he has prompt attention by a doctor. A record of his history and disability together with his employment card are kept on file. These cards go to a doctor for comparison, and if the case is legitimate the treatment continues until disability ceases. If the case looks questionable, the social service department investigates it and takes action accordingly. Cases in which disability lasts over four weeks go to the chief surgeon, who makes an examination and report. The chief surgeon's word is final, and the man either goes to work or receives further treatment.

A firm hand by industrial boards in dealing with malingerers is essential. A group of expert diagnosticians would include a well-paid medical commissioner versed in industrial medicine and surgery and in the detection of malingering, and well-paid chief medical examiners. The expert should be acquainted with industrial conditions, should study the individual and know character, should have a fair knowledge of decisions of state boards and courts in various types of cases, and, finally, he should have a thorough knowledge of pathology.

In conclusion, it may be said that in attempting to recognize the disease, investigate the causes, and treat the condition, there is one point in view, namely, that of returning the sick or injured employees to work in the shortest possible time consistent with good recovery. This saves an economic loss to the employer and protects the honestly disabled employee who, by reason of his honesty, should profit in proportion as the malingerer should suffer. — R. Thomson.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

Employer not Liable for Negligence of Physician. Jour. Am. Med. Assn., Jan. 17, 1920, 74, No. 3, 198–199. (Richardson v. Greenburg (N. Y.), 176 N. Y. Supp. 651). — The following is quoted from the above journal:

"The Supreme Court of Arkansas affirms a judgment on a verdict directed in favor of the defendant in this case where the plaintiff alleged that while he was employed by the defendant he had his fingers crushed, and was directed to go to a physician employed by the defendant to treat its injured employees, and that this physician treated his injuries so carelessly and negligently that the amputation of all the fingers on the injured hand became necessary. The court says that the testimony in the case appeared to have been addressed to the proposition that the physician was negligent, and that the defendant was liable for this negligence because it directed the plaintiff to consult him. There was no intimation in the pleadings that the defendant was negligent in selecting a physician, nor was there any testimony to that effect unless it was by inference that the defendant was negligent through having employed a negligent physician. The court had a case, therefore, in which the pleadings and proof showed only that an injured employee was directed to, and placed in charge of, a physician who was guilty of negligence in his treatment of the case. But this allegation and this proof did not make a case for the jury. Where the employer owes his employee the duty of furnishing medical attention, or undertakes to discharge that duty, he does not become liable for the physician's negligence or lack of skill, but is liable only when he fails in the discharge of his duty to exercise ordinary care to select a physician possessing the requisite skill and learning and one who would give the patient the attention and treatment which the case requires."

DEATH FROM GLANDERS CONTRACTED THROUGH INHALATION. Jour. Am. Med. Assn., Jan. 17, 1920, 74, No. 3, 198. (Richardson v. Greenburg (N. Y.), 176 N. Y. Supp. 651). — The following is quoted from the above journal:

"The Supreme Court of New York, Appellate Division, Third Department, holds, in answer to a question certified to it by the state industrial commission, that where an employee was required to lead a horse affected with glanders and during such time contracted the disease through inhalation of the bacteria, and died from the disease fourteen days thereafter, his death was not due to an accidental injury arising out of and in the course of his employment, within the meaning of the workmen's compensation law. The court says that compensation is payable by an employer only 'for the disability or death of his employee resulting from an accidental personal injury,' and that 'injury' and 'personal injury' are stated to 'mean only accidental injuries arising out of and in the course of employment, and such disease or infection as may naturally and unavoidably result therefrom.' The plain meaning of the words of the law, without the aid of judicial interpretation, induces the conclusion that the legislature intended to make compensatory no condition or death resulting from disease, unless the disease itself followed a traumatic injury or other injury not partaking of the nature of a disease. It is a matter of common knowledge that the conditions generally prevailing in cases of infectious disease are caused by poisons or toxins exuded by living organisms or bacteria present within the human body. Glanders cannot be differentiated from other diseases by the fact that ordinarily it is a disease which affects a horse rather than a human being, for it cannot matter whence the bacteria have proceeded which set up disease within the human body."

THE INSURANCE COMPANY IN INDUSTRIAL HYGIENE. *A. D. Reiley.* Am. Jour. Pub. Health, Feb., 1920, 10, No. 2, 160–163. — Thus far insurance companies have not done nearly the amount of work in industrial hygiene that they have done in safety. During the past ten years the growing feeling that it is the duty of a life insurance company to cover by its protection as many lives as possible has induced the wiping out of many of the occupational restrictions, and a search on the part of the companies for material and data on which to base the rates charged for dangerous and unhealthy employment. These and other forces will eventually compel both the accident and workmen's compensation group of companies and the industrial and old-line life group to do more and more work in industrial hygiene.

From the industrial standpoint, there are two main methods of selecting a life-insurance risk — the individual and the class methods. In the latter the mortality experience of the industry is procured as nearly as possible from the whole country and a general rate imposed on the hazardous jobs. By the individual method some means are used for charging a different rate for selected risks, based on the intelligence of the worker and the general hygiene of the plant where he works, including dust and fume removal, accident protection, provisions for the protection, health and comfort of the worker, and minimization of special hazards. This plan has a great educational value with the worker and with the employer as well.

The recently developed plan of group insurance will, however, produce the most work and the greatest direct benefit to industry from the standpoint of industrial hygiene of all life-insurance efforts. This provides for the insurance by a plant of all its operatives without medical examination. This furnishes the opportunity and incentive for constructive work in studying and improving industrial conditions, the insurance company employing a group of skilled industrial men to study each problem presented and to work actively with the plant management in instituting improvements in safety and sanitation as a basis for reduction in the insurance rates for that plant. — Henry Field Smyth.

ABSTRACT OF THE LITERATURE

OF

INDUSTRIAL HYGIENE

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GENERAL

PROGRESS TOWARDS PHYSICAL FITNESS IN THE UNITED STATES. *Jessie Payne.* The Child, Feb., 1920, 10, No. 5, 200–205. — A wave of interest in recreation and constructive physical training is passing over America. Indications of this are the National Physical Education Service established by the Playground and Recreation Association of America, and the introduction of compulsory physical training in fifteen states. The play movement grows rapidly. In some industrial cities where the community service is in operation — Chester, Bridgeport, Waterbury — men and women are turning in large numbers toward the recreational life. The impromptu playgrounds are increasing in popularity. The day is at hand when all states will pass adequate laws providing physical education for schoolchildren. — G. E. Partridge.

INDUSTRIAL HEALTH HAZARDS. *Charles A. Lauffer.* Safety Engin., Nov., 1919, 38, No. 5, 279–282. — The author sums up the hazards of employees as arising from:

1. Poisons, dust, fumes, gases.
2. Heat, humidity, ventilation.
3. Lighting.
4. Crowding.
5. Fire peril.
6. Association with diseased employees.

Employers' hazards are grouped as:

1. Decreased production; machines lie idle; sick employees are irregular, discouraged.
2. Excessive labor turnover, due to ill health,

unfitness for jobs assigned, prevalence of epidemic and infectious diseases.

3. Increased accident compensation expenditures, due to sickness masquerading as injuries. Cases arise daily where conditions are pathological, but trauma is alleged; or in which a minor trauma has provoked a long period of disability or an unusual degree of permanent impairment follows injuries, not in consequence of the gravity of the injury, but owing to intercurrent disease or the previously impaired vitality of the traumatized individual.

Among the remedies suggested for these health hazards are industrial health clinics, legalized releases for defects that cause abnormally long periods of accident disability, obligatory post-mortems, and federal health charts. — R. M. Thomson.

Labor Unions Help in Japanese Industrial Problems. *D. R. Simmons.* American Federationist, March, 1920, 27, No. 3, 344–345. — At present there exists but one labor union in the Japanese Empire, and this operates in but three cities. But these three cities — Kobe, Osaka and Kyota — contain nearly a fourth of all the laboring population of Japan. The very rapid increase in industrialism in Japan has introduced grave problems. Thirty years ago there were 125 factories, employing in all 15,000 people; now there are 25,000 industrial plants, and 2,000,000 employed. Thus far there is only one factory law applying to the employment of women and children, providing that children under 12 cannot be employed, and children under 15 and women cannot work more than twelve hours a day, and providing two holidays a month for this group. But for various reasons factories may be exempted under the law from fulfilling these regulations, so that the law as it stands is not effective. In general, there are bad working conditions, long hours, small wages and a pervading unhealthy atmosphere, tending to undermine the usefulness as well as the morals of the women workers. It is reported that in Tokyo, where industrial workers live in crowded districts, 66 per cent. of 1100 families live in single rooms averaging 9 by 9 feet in size. The cost of living has advanced 260 per cent. and there has not been a proportionate increase in wages. — G. E. Partridge.

International Labor Legislation. Bulletin of the International Labor Office, 1916, 11, Nos. 8, 9, 10. — These bulletins summarize laws and orders relating to labor in the United States, France, Germany, Great Britain and Ireland, British Colonies, Hungary, Netherlands, Norway, Sweden, and Switzerland. War emergency legislation — international, and in several of the belligerent countries — is also summarized. — G. E. Partridge.

Selling the Organization to the New Employee. National Association of Corporation Schools Bulletin, Jan., 1920, 7, No. 1, 19–25. — More and more industrial concerns are coming to feel that their own interests demand an introduction of the novice into the new and unfamiliar environment of the shop with as little friction as possible. Instructors are assigned to explain personally the new work to the men. Many firms publish booklets giving instructions. — G. E. Partridge.

Eastern Manufacturing Company Establishes a System of Proficiency Charts. National Association of Corporation Schools Bulletin, Jan., 1920, 7, No. 1, 39–42. — These charts give information expressed in terms of points and percentages. They show, in regard to individuals, quality of work, amount of production, lost time, etc. It is said that they are an aid in keeping men up to mark. — G. E. Partridge.

The Industrial Worker as a College Student: A Study of 86 Typical Cases at the Arts College of the Municipal University of Akron. *C. Bulger.* School and Society, Feb. 20, 1920, 11, No. 270, 265–270. — Every college has its group of self-supporting students, but the conditions and opportunities differ widely in different localities. Akron is a city of 200,000 people and is known as a rubber city though it has many kinds of industries. Recently adoption of a three-shift plan in some of the factories has proved favorable to working college students, since the second shift falls in the hours from 3 to 11 in the afternoon and evening. The article contains a table showing the standing of a group of entirely self-supporting students and another showing the standing of a group that is partially self-supporting. It is shown that in general the younger student tends to put the emphasis on the outside work rather than the college work, while the older student makes a better adjustment. The average grade of twenty-seven men entirely self-

supporting is 77.8, the passing mark at the university being 70. The average grade of all students of the university for a period of five years has been 77. The fifty-seven men included in the group of the practically self-supporting, however, show an average of only 70. The writer thinks the problem one deserving very careful investigation. — G. E. Partridge.

TECHNICAL EDUCATION AND CITIZENSHIP. *B. W. Bond, Jr.* School and Society, March 6, 1920, 11, No. 271, 271–276. — The tendency away from the liberal studies and towards the technical, now so strong, has certain dangers and some consequences already evident. A serious defect of this prevailing technical education is the neglect of the historical subjects — branches which are necessary for the training of the citizen. This is showing already in our lack of broad leaders having a right appreciation of American ideals. — G. E. Partridge.

THE THEORY OF THE VESTIBULE AND UPGRADING SCHOOL. *D. Snedden.* School and Society, March 6, 1920, 11, No. 271, 280–284. — Of 60,000,000 adult workers in the United States less than 2,000,000 (including homemakers) belong to the professions. There is, then, hardly more than a suggestion of adequate vocational training as systematized education for expert work. Recent experience has shown that training for industrial operations may be carried on in direct relation to productive work. The factory training school has been discovered to be an important educational institution serving the whole public. The vocational school located in the factory plant ought, then, to be maintained by public support. — G. E. Partridge.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

MENTAL

THE MOVEMENT FOR A MENTAL HYGIENE OF INDUSTRY. *E. E. Southard.* Ment. Hyg., Jan., 1920, 4, No. 1, 43–64. — This paper is a preliminary report of a research being conducted under the auspices of the Engineering Foundation of New York. It is an outline of a movement for the mental hygiene of industry. This movement is not new, for Southard quotes from papers published in 1917. He states that he wishes to speak primarily to the employment managers, and feels that he will be able to reach them because of the success of modern ideas in public health in general. What is now needed is the proper articulation into the public health movement of the mental hygiene movement.

The mental hygiene of industry may be divided into three main parts: (a) the psychology of industry, including mental tests for the hiring or the promotion of employees, and job analysis; (b) the psychiatry of industry, which is composed of such studies as fatigue, temperament, the effects of monotony, the problem of discharge of employees, grievances, labor turnover and the finding of jobs for the mentally subnormal and psychopathic; (c) psychiatric social work in industry. The problem here would be the tracking down of the causes of discharge of employees, grievances, dissatisfaction, and efficiency, and also the study of the effects of welfare work.

Southard also says that it was demonstrated at the Psychopathic Hospital that employment managers were not sufficiently trained to recognize individuals who would have been dangerous to hire. This was shown in a series of clinics for employment managers. These clinics proved so valuable that it is planned to arrange them on a permanent basis.

Examples are given of the good work of a psychiatric social worker, showing how employers can be induced to employ psychopathic individuals after the cases have been explained to them, and showing how well these individuals keep their jobs after the proper adjustments have been made.

The argument for a mental hygiene of industry may be put in the nutshell form as a question: "Why should not industrial managers seek the aid of (a) those who can measure at least a few of our mental capacities and have shown their abilities in war work, of (b) those who are the best specialists we yet have in temperament and the best experts in grievances yet developed, and of (c) others less professionally trained who are capable of tracing out or helping to trace out the actual situation of, per

example, labor 'turnover' as shown in the individual instance?" — S. Cobb.

Mental Hygiene a Public Health Activity. Editorial. Dementia Praecox Studies, Jan.–Apr., 1919, 2, No. 2, 62–63. — This editorial emphasizes the need of hygienic measures to control the production of mental diseases. The public is inclined to think of mental disease as a dispensation, and has little knowledge of the causes and of the early stages. The lowest estimate is that there are 4 feeble-minded and 2 insane per 1000 of population in this country. The first selective draft rejected 24 men per 1000 because of nervous or mental disorders. Of 84,000 in almshouses in 1910, at least 42,000 suffered from some form of mental alienation. — G. E. Partridge.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

The Removal of Carbon Monoxide from Air. *Arthur B. Lamb, William C. Bray,* and *J. C. W. Frazer.* Jour. Indust. and Chem. Engin., March, 1920, 12, No. 3, 213–221. — This article is a summary of the investigations on the removal of carbon monoxide from air carried on at the American University Experiment Station and at co-operating laboratories during 1917 and 1918.

The dangers of carbon monoxide in war and in peace and the difficulty of removing this gas from air are described, together with the requirements for a substance which can absorb the gas. The results obtained with a large number of absorbents are outlined and the advantages and disadvantages of each are considered. The group of absorbents which proved satisfactory was not discovered until 1918 when a catalytic mixture of metallic oxides, such as oxides of manganese, copper, cobalt, and silver, was employed with success. A mixture of this nature, called Hopcalite I., remained absorbent indefinitely against any concentration of carbon monoxide, provided the effluent air was adequately dried. The life of the canister containing the absorbent was therefore limited solely by the life of the drier. — G. M. Fair.

Gas Absorption by Charcoal. Engin., Feb. 20, 1920, 109, No. 2825, 250–251. — Observations on the selective absorption of gases by charcoal and upon the absorption of heat-treated charcoal. — G. M. Fair.

Felt Hat Making by the Acid-Nitrate-Mercury Method, and the No-Nitrate Method. *Christine Kefauver.* Month. Bull. N. Y. City Dept. Health, May, 1919, 9, No. 5, 127–128. — A description of the new no-nitrate method of preparing felt for hat making, discovered by William Braun. This eliminates the injurious effects of the old acid-nitrate-mercury method, in every process of which the workers were exposed to the fumes of mercury. In addition to the tremendous gain to the health of the workers, the saving in cost of production is said to be enormous. — L. A. Shaw.

Mercury Content of the Urine of Employees in a Chemical Industry. *H. Ilzhöfer.* Abstracted from Münch. med. Wchnschr., 1919, 66, pp. 14–15, and Zentr. Biochem. Biophys., 20, p. 508, by H. S. Paine in Chem. Abstr., Dec. 10, 1919, 13, No. 23, 3243. — "The Hg content of the urine of employees in a factory in which Hg and HgO were used in large amount was determined by the Buchtala electrolytic method. The analytical results are given in tabular form together with the clinical observations. There was no parallel variation between the excretion of Hg and the symptoms of poisoning. The Hg content of the urine increased, however, with the 'possibility of absorption' of Hg (comparison of employees working in portions of the factory in which varying amounts of Hg were vaporized)." — W. O. Fenn.

Report of Cases of Poisoning by Nitrobenzol. *Tuszewski.* Therap. d. Gegenw., Sept., 1919, 60, No. 9, 326–329. — A small bottle of nitrobenzol ($C_6H_5NO_2$) was sold to a workman in the city of Berlin, supposedly as benzaldehyde (C_6H_5CHO), a widely used flavoring extract. He and two of his children were severely poisoned after the ingestion of from 1–2 c. c. of the liquid. The father, a man of 40 in good physical condition, was only mildly ill. On awakening shortly after midnight, having taken a cubic centimeter or less of the fluid at the evening meal, he found himself dizzy and mentally confused. He was obliged to remain in bed for several days in a

weak and drowsy condition. Objectively his skin was pale, lips cyanotic, and blood pressure low. The urine remained normal.

The son, aged 13, in good health, partook of the poison before retiring and was found in a stuporous condition by his parents at half-past twelve. He was transferred to the hospital the next morning, where he gradually regained consciousness under constant inhalation of oxygen and the infusion of physiological salt solution. His skin was pallid, hands and lips bluish-black, lungs and heart negative, radial pulse rapid and hardly palpable. The blood pressure was 95/65 mm. Hg. A reddish urine was passed which was negative for albumin, sugar, bilirubin, urobilin, urobilinogen and hematoporphyrin. Indican was found increased. The following day a subicteric tint of the skin was noted and a left-sided facial paralysis developed. The spleen was easily palpable; leucocyte count 9700; hemoglobin 53 per cent.; blood pressure 83/43 mm. Hg; temperature 38°C.; pulse 70–80. His condition slowly improved and five days later the icteric tint had faded, the spleen was no longer palpable, and the facial paralysis had disappeared. At this time the blood pressure had risen to 95/30 mm. Hg, the hemoglobin to 55 per cent. The red count was 3,200,000, the leucocyte count 9400. A differential count showed 11 per cent. myelocytes and 3 per cent. Turk irritation forms. Poikilocytosis and anisocytosis as well as chromatophilia were noted. The urine was negative for albumin, sugar, bilirubin, and hematoporphyrin. Tests for urobilin and urobilinogen were positive. Two weeks later the patient was discharged, and at that time the leucocyte count was 9000, the erythrocyte count 3,900,000, the hemoglobin reading 68 per cent. The blood pressure had risen to 96/45.

A daughter, a well-developed girl of 16, was similarly poisoned and taken in an unconscious condition to the hospital, where the same therapeutic measures were immediately resorted to. Venesection was unsuccessfully attempted and scarcely any blood could be obtained, until finally the radial artery was severed. The patient did not regain consciousness, and after a series of clonic convulsions died twenty-two hours after taking the poison. An autopsy was not performed until six days after death, when nothing of importance aside from post-mortem changes was noted. Tests for nitrobenzol in the blood and urine were positive.

The writer calls attention in these three cases to the injurious effect of nitrobenzol upon the vasomotor center as evidenced by the pallor of the skin, the cyanosis of face and hands, and the low blood pressure. — G. B. Wislocki.

Dinitrobenzol Poisoning. *A. H. Hübner.* Deutsch. med. Wchnschr., Nov. 13, 1919, 45, No. 46, 1273. — The author reports on the condition of five patients about a year after they had left the dinitrobenzol factory. Breathlessness, palpitation, pains in the joints, and headaches disappeared in the course of a few weeks. The easy fatigue, loss of energy, listlessness, and irritability persisted somewhat longer. The gross disorders of sight, hearing, and sensation disappeared only exceptionally. The optic atrophy and central deafness persisted, as did the absence of certain reflexes. Otherwise, the physical examination was negative. Only one of the five considered himself well.

The author believes that dinitrobenzol is especially harmful to women, producing menstrual disorders and sometimes abortion.

A case of alleged criminal poisoning by dinitrobenzol is cited, with autopsy findings. — T. J. Putnam.

Hazards of the Dye Industry. *A. K. Smith.* Am. Jour. Pub. Health, March, 1920, 10, No. 3, 255–257. — This paper is a brief report of conditions met with in the dye industry as conducted by the E. I. du Pont de Nemours Co. The hazards discussed are the accidental burns from mixed acid, accidental escape of nitrous fumes and poisoning by inhalation or skin absorption of nitro and amido compounds of the hydrocarbon compounds of the benzene series. In many cases it is difficult to ascribe the poisoning to any particular chemical, and the credit is given to the main product of the factory area where the case occurred. Special reference is made to skin irritation produced in susceptible individuals handling these compounds and it is stated that habitual drinkers of alcoholic liquor are especially liable to these skin inflammations. Periodic blood examinations on many thousand cases show no marked changes of any kind except for the decreased hemoglobin and the formation of methemoglobin in acute cases. No fatalities from anilin or its allied compounds have been noted and no definite chronic poisoning has been produced.

Properly equipped buildings, well ventilated, and constant improvement in methods of production and handling, together with proper

selection and care of the workmen, will reduce the hazards in the dye industry to those of any other industry. — H. F. Smyth.

Wood Alcohol Poisoning. *R. P. Albaugh.* Mod. Med., Aug., 1919, 1, No. 4, 300. — A very brief statement giving the general effects of wood alcohol. There is no direct data upon industrial poisoning. — C. K. Drinker.

Mustard-Gas Poisoning. *C. M. Wilson* and *J. M. Mackintosh.* Quart. Jour. Med., Jan., 1920, 13, No. 50, 201–240. — The authors analyzed a series of 1500 mustard-gas casualties. It was estimated that a functional neurosis was recognized in 22 per cent. of all admissions in the mustard gas group. The incidence of the commoner neuroses was: functional photophobia, 12.6 per cent.; functional aphonia, 7.2 per cent.; functional vomiting, 1 per cent.; effort syndrome, 1.2 per cent. These functional disorders appear to arise in many cases from slight initial organic lesions. From the point of view of organic effects on the respiratory tract, all degrees of laryngitis were encountered, from slight cases with hoarseness and painful cough to a grave condition associated with the formation of a false membrane. Infection seemed to follow very frequently on the destruction of epithelium in the trachea and bronchi, soon after which signs of bronchitis and pneumonia often appeared. Out of 692 cases admitted to the hospital in four months, 14 per cent. developed a severe bronchitis or bronchopneumonia. The distinction between bronchitis and bronchopneumonia in gas poisoning is artificial. In twenty-two necropsies, consolidation was absent in four, lung abscess was found only four times, and gangrene of the lung only once. Bronchiectasis was a rare event in cases that recovered; it was present in 1 per cent. of all cases admitted. The eyes were affected in 74.6 per cent. of the cases. Involvement of the gastro-intestinal tract was unusual. Vomiting after the first day was also unusual. Out of eight cases in which vomiting was prolonged, six were extensively burned. The blood only showed a leucocytosis which was in no way peculiar to the bronchopneumonia following gas poisoning. Femoral thrombosis occurred in two cases. The results of blood pressure readings were largely negative. Contrary to the French view, kidney involvement was rare in the absence of extensive burns. Burns beyond a mere erythema were present in 31 per cent. of all cases. The incidence of influenza and common colds was no commoner in gas wards than in the other medical wards. In a small epidemic of diphtheria, the incidence of carriers among the convalescents from gassing was much higher than among other convalescents. The mortality of mustard gas poisoning was about 2 per cent.; 87 per cent. of all cases which arrived at the base hospital were able to march again within a month.

Concerning the pulmonary sequelae of mustard gas poisoning it is observed that in some men, previously healthy, it induces a condition of chronic bronchitis, pulmonary fibrosis, and rarely phthisis. It is not possible to say that the slight evidence of emphysema found in a few cases was not present before gassing. — H. A. Bulger.

Chromate Poisoning. I. Skin Lesions. *Urban;* II. Eye Changes. *C. Colden;* III. Pathological Anatomy. *R. Hanser;* IV. Clinical Aspects of Chromate Poisoning. *Forschbach.* From the Dermatological Division of the Allerheiligen Hospital in Breslau. Original in Berl. klin. Wchnschr., 1919, p. 363. Following is a translation of the abstract in Therap. Monatsh., Aug., 1919, 33, No. 8, 319. — "In the preparation of an antiscabetic salve a salt of chromic acid, probably potassium chlorate, was accidentally used in place of the sulphur. A number of patients were severely poisoned and twelve of them died. The constitutional effect was greatest in those patients suffering from scabies, whose skin was much excoriated. The effect upon the skin consisted of a strong burning sensation and the appearance of areas of necrosis which became confluent and progressively deeper. — The ocular lesions were neither extensive nor severe. In four out of thirty-one patients vascular changes in the retina were noted, in two pallor of the optic disks, in one anisocoria, in one retinal ecchymosis. — Description of the pathological anatomical findings. — Clinically, the condition presented a picture of extreme renal insufficiency with scant albumin and few cells. A gradual change from oliguria to polyuria occurred, but in some the renal function remained greatly impaired, manifested in an inability of the kidneys to concentrate the urine. The blood changes were noteworthy, consisting principally in bone marrow stimulation. — Therapeutic measures were of no avail in the severe cases." — G. B. Wislocki.

DUST HAZARDS AND THEIR EFFECTS

Elimination of Dust Hazard at Niagara Falls Plant. Chem. and Metall. Engin., Feb. 25, 1920, 22, No. 8, 348. — A survey of the chemical and metallurgical plants at Niagara Falls by the United States Public Health Service has led to the installation of means for the removing of dust from factory air and for minimizing hazards from fumes and poisonous gases. — G. M. Fair.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

Non-Specific Immunity. *Victor C. Vaughan* and *G. T. Palmer.* Mil. Surgeon, Jan., 1920, 46, No. 1, 1–8. — An explanation is offered of the fact that, when armies are recruited and men crowded together, those from areas sparsely populated and unaccustomed to the crowd life are more susceptible to infection, and that seasoned soldiers bear even newly imported infections better than do fresh recruits. The authors believe that this increased resistance to infection is similar to that displayed by animals after injections of protein poisons, and they ascribe it to the difference in the amount of bacteria and other proteins absorbed by the lungs. — H. A. Bulger.

Statistics of the 1918 Epidemic of Influenza in Connecticut. *C.-E. A. Winslow* and *J. F. Rogers.* Jour. Infect. Dis., March, 1920, 26, No. 3, 185–216. — The rapid spread of influenza and the fact that rigidly maintained quarantine completely protected isolated groups of individuals from contracting the disease, indicate clearly that it was transmitted by human contact, supplemented in certain cases, perhaps, by the use of infected food and utensils. The mortality was proportionately higher among males than among females, and proportionately very much higher in individuals under 5 years of age and in those from 20 to 40 than at other periods of life. It seems doubtful that the lower mortality in later life can be attributed to immunity acquired in the 1892 epidemic, since immunity due to this cause would have been evident in the age period from 30 to 40 years which, in fact, showed about the same rate as the age period 20 to 30. Native Irish, English, and Germans showed a relatively low mortality; Canadians, Russians, Austrians, and Poles showed a relatively high rate; Italians, an exceedingly high rate. The mortality was lower in rural than in urban communities, lower in agricultural than in manufacturing communities, and very low in a group of small towns remote from any railroads. In general, mortality was highest in those communities which were affected earliest. No evidence was found that variations in administrative procedure, such as the closing of schools, exerted any influence on the spread or the severity of the disease. — H. A. Bulger.

Mumps: A Review of our Knowledge Concerning its Etiology, Mode of Transmission, Incubation, and Period of Infectivity. *Conrad Wesselhoeft.* Mil. Surgeon, Jan., 1920, 46, No. 1, 63–82. — The causative factor of mumps is still undetermined. It has been shown that a filterable virus in the saliva (which is sterile by the ordinary aërobic and anaërobic methods) will cause a parotitis in cats. The blood serum contains the exciting element, thus explaining the manner in which many of the complications are brought about. The mode of transmission is by direct and indirect contact. Infection by fomites seems possible. There is no record of epidemics traced to water or milk supply, but food has been considered by some as a possible source of infection. The incubation period of mumps is still unsettled. When contacts are isolated this should be for from fourteen to twenty-four days after exposure. The period of infectivity is unsettled. The general trend is to be guided by the duration of symptoms. An extensive bibliography is given. — H. A. Bulger.

Investigations on the Etiology and Clinical Picture of Epidemic Jaundice. *Julius Hatiegan.* Wien. klin. Wchnschr., Sept. 25, 1919, 32, No. 39, 956. — The author studied catarrhal icterus of epidemic variety and concludes that this is an acute infection and intoxication confined to the liver. It is associated with mild pathological change in the bile capil-

laries and degenerative changes in the liver cells. The etiological agent is apparently a member of the colon group of organisms and possesses marked motility. — Barnett Cohen.

THE DIAGNOSIS OF CHRONIC GLANDERS. *Albert W. Bauer.* Wien. klin. Wchnschr., Nov. 20, 1919, 32, No. 47, 1134. — Chronic glanders is to be suspected in cases presenting multiple periarticular and muscular abscesses associated with high, septic temperatures when the focus and etiology of the pyemia are obscure and the occupation of the patient suggests a possibility for glanders infection. Support for this may be found in the discrepancy between the good subjective state of the patient and his marked septic condition, as well as in the relative reduction in pulse rate. Even if the bacteriological examination of the pus fails, serologic tests on the blood (agglutination and complement fixation) will establish the diagnosis. — Barnett Cohen.

DISINFECTION METHODS AGAINST TRYCHOPHYTE INFECTION (SYCOSIS BARBI) IN BARBER SHOPS. *Wolfgang Löwenfeld.* Wien. klin. Wchnschr., Sept. 18, 1919, 32, No. 38, 941. — Mechanical cleansing must always stand as the first effective instrument against the spread of this ring-worm infection. Water at 100°C or 10 per cent. soda solution at 80°C killed the organism and its spores within five minutes. Alcohol, 80 per cent., or phenol, 2.5 per cent., sometimes failed to sterilize within thirty minutes. Formalin, 2 per cent., was very effective in thirty minutes. — Barnett Cohen.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

MINERS' NYSTAGMUS. *T. Lister Llewellyn.* Abstract of a paper read before the Institute of Mining Engineers (Great Britain), Jan. 12, 1920. — The first case of miners' nystagmus was described by Decondé in 1861, and it was not until after the compulsory introduction of the safety lamp in 1876 that an increase in the number of cases began to attract general notice.

The cause of this disease is now usually considered attributable to the inefficient lighting system in use in the safety lamp coal pit, as it is rare in the naked light districts. Dr. Llewellyn states that there are two varieties of nystagmus: (1) latent, (2) manifest. The symptoms include failure of sight, dazzling effect of lamps, giddiness, headache, etc. Serious as this disease is when looked at from the point of view of the individual sufferer, its importance to the industry as a whole must be taken into consideration.

Dr. Llewellyn estimates the cost of the disease to the nation to have been over £100,000 in 1910. At present day prices it is computed at over a million sterling per annum. Moreover, the miner suffering from nystagmus may be a source of direct danger to himself and others owing to his failure to detect the presence of gas. Of 49 normal men examined for the detection of the firedamp cap, 21 gave an incorrect result; while of 41 nystagmus cases, 37 gave an incorrect, and only 4, a correct result.

Dr. Llewellyn thinks that the illumination at present found in the open light pits should be taken as a standard. This means, as he points out, a fivefold increase in the illumination now obtaining in the safety lamp pits. Even with this increased illumination, the author does not think the disease will be completely eradicated and, as he is careful to point out, the full benefit will not be reached for some years.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

SAFETY MOVEMENT IN ENGLAND. U. S. Bur. Labor Statis., Month. Labor Rev., Dec., 1919, 9, No. 6, 302–304. — Reference is made to an article by Mr. Gerald Bellhouse entitled *Accident Prevention and Safety First*, which appeared in the Annual Report of the Chief Inspector of Factories and Workshops of Great Britain for 1918. Up to the onset of the war, England relied chiefly on factory inspection to reduce the number of industrial accidents. The year 1917, however, marked the establishment of the British Industrial Safety First Association. The various improvements made in English plants through the efforts of the association are considered in the report. It is interesting to note how similar British practice is to our own.

Unfortunately, however, the lack of statistical information makes it impossible to say how Great Britain's accident rate compares with that of the United States. — R. B. Crain.

Fundamental Principles of Safeguarding. *Sidney J. Williams.* Safety Engin., Oct., 1919, 38, No. 4, 217–219. — The author treats this problem under two headings: *What Shall I Guard?* and *How Shall I Guard It?* The answer to the first question is briefly that if a plant is to be 100 per cent. safe, it is necessary to guard every moving part wherever located. If a moving part is in a place "where nobody ever goes," it should be remembered that someone is likely to go sooner or later for some reason which cannot be anticipated. The second half of the subject includes general suggestions in regard to safeguards and their application to specific cases, such as guards for gears, bolts, flywheels, shafting, etc. — R. M. Thomson.

Is Industrial Death Necessary? *Lucian W. Chaney.* Safety Engin., Oct., 1919, 38, No. 4, 196–198. — A negative answer to this question is greatly to be desired. If such an answer is ever to be obtained, it will be because the safety men of the country have faith in its possibility, and energy according to their faith. In 1907 the severity for the iron and steel industry was not less than 21.6 days per worker; in 1913, 13.9 days; in 1917, 12.2 days. A preliminary figure for 1918 shows 10.9 days. In his experience with the industrial accident problem, the author has become convinced of two things: (1) that the accepted method of estimating industrial hazard by means of frequency rate is wholly inadequate; (2) that the factor of personal carelessness is being overstressed very greatly. The following conclusions are given:

1. The general frequency rate is an index of the prevalence and fluctuation of minor injury. The reduction of this type of injury depends on an educational program, the final effect of which is to cause the men to do their work in a safer manner. A rising frequency rate may indicate one or all of three conditions: (a) no educational program or a poor one; (b) a good program administered with poor judgment or with insufficient vigor; (c) industrial conditions which might for a time overbalance any program however good.

2. The general severity rate is an index of conditions in regard to death and major injury. The reduction of this type of injury depends in very large measure upon the procedures included in the expression "engineering revision." When the severity rate rises there should be immediately a very searching inquiry for possible imperfection in the engineering program. — R. M. Thomson.

When Machinery Must be Guarded. *Chesla C. Sherlock.* Machinery, Jan., 1920, 26, No. 5, 450–451. — Employers must be guided more or less by decisions handed down by the courts in the matter of guarding machinery, as it is evident that all machinery, tools and appliances are not dangerous within the meaning of the law, nor are all dangerous agencies employed in the average shop machines or appliances within the meaning of the law. The safeguards required are not necessarily the best or latest on the market but of such a kind as reasonably prudent men employ in a particular industry. A law is considered notice to everyone the minute it is written into the statute books and employers must, therefore, be familiar with the requirements. It is not the intention of the statutes to interfere with the practical operation of machinery. In fact, it is held in a number of states that the safety appliance act is inapplicable when the measures necessary to safeguard the machine are such that they destroy its value. The following conditions are given as those under which employers must guard machinery:

"1. When it is expressly required by the statute; that is, when certain kinds of machinery are named in the statute itself.

"2. When this machinery is dangerous to the life and limb of a workman under normal and careful operation; or where it is plainly evident that the machine should have been included in the enumerated list of the statute, but was apparently overlooked. Where there is no list given in the statute, the employer can only have discharged his duty when he has safeguarded all dangerous machines or appliances as a reasonably cautious man in the same profession, trade or calling would have done." — R. M. Thomson.

Safety Education in Textile Industry. *William S. Ide.* Safety Engin., Nov., 1919, 38, No. 5, 284–285. — A brief outline of how safety education is applied at the mills of S. Slater & Sons, Inc. The cost of accidents to the corporation as well as to the injured is impressed

upon the employees by posting each week a report of accidents and their costs. Safety work by the overseer of a department is just as much a part of his job as production. — R. M. Thomson.

PREVENTING ACCIDENTS IN THE SHOP. *J. E. Bullard.* Am. Machinist, March 4, 1920, 52, No. 10, 503–504. — Accident prevention is as much a matter of education as of safeguards. Some hints are given as to the type of clothing which should be worn in machine shops. — G. M. Fair.

COKE-OVEN ACCIDENTS IN THE UNITED STATES DURING THE YEAR 1918. U. S. Bur. Labor Statis., Month. Labor Rev., Dec., 1919, 9, No. 6, 299–302. — With the development of the by-product process, accident rates, high from the beginning, have shown a steady tendency to increase. A study of mortality statistics compiled by the Bureau of Mines and the Bureau of Labor Statistics definitely shows this. As regards the cause of the increase, inspection of the tables shown leads one to infer that:

1. It seems probable that the disturbed situation of the working force, characteristic of war years, is mainly responsible. It is also suggested that the influenza epidemic in the latter part of 1918 may have affected the accident rate.

2. In both beehive and by-product ovens the prolific cause of fatal injury is the transportation system. Of the rate in 1918 of 2.84 per 1000, 1.36 cases are credited to various elements of the transportation. This hazard has been found everywhere a difficult one with which to deal. — R. B. Crain.

EXPLOSION HAZARD IN STEEL MILLS FROM PARTLY CONSUMED COAL DUST. Chem. and Metall. Engin., March 3, 1920, 22, No. 9, 422–423. — This review of the *Monthly Reports of Investigations* of the Bureau of Mines for December, 1919, deals with a study of the hazard introduced into steel mills by the substitution of powdered coal for natural gas in the heating furnaces. Conditions leading to explosions and fires are explained and precautions which may be taken for their prevention are discussed. — G. M. Fair.

DANGERS IN THE DYESTUFF INDUSTRY. *L. C. Cone.* Safety Engin., Nov., 1919, 38, No. 5, 282–284. — An article dealing with the risks of explosions about dyestuff plants. With the growth of the American chemical industry the explosion hazard will become greater and greater, and if the industry is to be permanently successful, it must not permit itself to be restrained because of explosion risks. By successful co-operation between the safety engineer and the technical men of his organization, it will be possible gradually to eliminate the explosion risks of this industry. — R. M. Thomson.

DANGERS IN THE DYESTUFF INDUSTRY. *L. C. Cone.* Chem. and Metall. Engin., Jan. 7, 1920, 22, No. 1, 33–35. — A review of incidental accidents due to inexperience in new industries, with special reference to the dyestuff industry. Explosion risks of dyes and intermediates, of high-pressure apparatus, and of inflammable vapor mixtures are discussed. — G. M. Fair.

PREVENTING ACCIDENTS IN GAS PLANTS. *J. F. Conner.* Chem. and Metall. Engin., March 3, 1920, 22, No. 9, 421. — This paper, read before the Eighth Annual Safety Congress of the National Safety Council, deals with the inherent hazards of the industry, the precautions against dust explosions, the use of respirators for emergency work, and methods of preventing accidents, especially from the point of view of educational propaganda. — G. M. Fair.

THE PERSONAL ELEMENT IN A SAFETY PROGRAM FOR THE FOUNDRY. *M. F. Gartland.* Chem. and Metall. Engin., Feb. 18, 1920, 22, No. 7, 323–325. — Abstract of paper read at the Eighth Annual Safety Congress of the National Safety Council, Cleveland, Ohio, Oct., 1919. — G. M. Fair.

APPLICATION OF SAND BLAST TO GENERAL FOUNDRY WORK — II. *H. D. Gates.* Am. Machinist, Jan. 8, 1920, 52, No. 2, 73–76. — Ample protection for operators should stand foremost in the minds of the designers of sand-blast equipment. This is accomplished to some extent by providing mechanical means of handling material, with accompanying savings in labor cost and time. — G. M. Fair.

SAFETY FEATURES OF BRITISH SWITCHGEAR. *B. E. Mittell.* Electrical World, Feb. 7, 1920, 75, No. 6, 309–312. — Progress has been made

in England toward protecting operators from shock in switch-board manipulations. Three types of switchgear in common use are described in detail to show how the safety of operators is effected. — G. M. Fair.

Emergency Fire Protection Connections to Municipal Water Systems at Hartford, Conn. Jour. Am. Waterworks Assn., March, 1920, 7, No. 2, 221–222. — A memorandum on experiences with check valves at Hartford, Conn. — G. M. Fair.

Water Works for Fire Protection. *H. F. Blomquist.* Jour. Am. Waterworks Assn., March, 1920, 7, No. 2, 223–231. — This paper discusses the principles of design of water works for fire protection service and the value of such service, together with methods used by various municipalities in paying for it. — G. M. Fair.

Grounding and Polarization as Protecting Measures: Part I. *W. J. Canada.* Electrical Rev. (Chicago), Feb. 28, 1920, 76, No. 9, 351–354. — A discussion of the reasons and methods for grounding certain electrical circuits in order to afford adequate protection against fire and life hazard. — G. M. Fair.

INDUSTRIAL SURGERY

The Importance of Physical Therapy in Military and Civil Practice. *William S. Bainbridge.* Mil. Surgeon, Dec., 1919, 45, No. 6, 663–678. — The war having shown us that the majority of disabled men can be retrained and re-educated, we must now apply the lesson to civil life. That industry takes a heavy toll yearly is nowhere so evident as in the United States. Physical methods are of the greatest importance in securing and maintaining general health, and will render a large percentage of the unfit able to endure prolonged exertion. It is suggested that facilities should be afforded at medical schools and hospitals for medical men and medical students to become instructed in the science and practice of physical therapy, treatment by which is effective in many functional disorders and in some diseases. — H. A. Bulger.

The Paraffin-Wax Treatment of Burns, with Special Reference to Mustard-Gas Burns. *James S. Taylor.* Mil. Surgeon, Jan., 1920, 46, No. 1, 83–93. — Taylor concludes that all burns become infected although they may be sterile at the time of receipt, that the Carrel technique of handling burns is superior to any other method, and that the paraffin-wax treatment has proved its worth in every particular, both from the point of view of the surgeon and from that of the patient, in that with its use the time of disability is shortened, suffering is lessened, and deformities and contracting cicatrices are prevented. — H. A. Bulger.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

Activity and Rest in Animals and in Man. *J. S. Szymanski.* Ztschr. f. allg. Physiol., 1919, 18, No. 2, 105–162. — This is an interesting and important study of activity in various animals and in the human infant. The experiments were made with the "Aktograph," several modifications of which were devised by the writer. The apparatus was arranged to record intensity and frequency of motion during a continuous period of twenty-four hours. Special investigations were made on the influence of sunlight upon activity and on the depth of sleep. The paper seems to have most value as a study in method of experimentation. — G. E. Partridge.

Fitness and Breathing during Exertion. *Henry Briggs.* Jour. Physiol. (Proc. Physiol. Soc.), Sept. 5, 1919, 53, Nos. 1 and 2, xxxviii–xl. — A comparison is made between the respiration of a trained and a sedentary subject doing measured work upon a bicycle ergometer. The trained man breathes much less air for the same accomplishment. He uses slightly less oxygen. The percentage of CO_2 in his expired air is roughly six against four for the

untrained subject with his less economical mode of breathing. Air enriched with oxygen is more helpful to the sedentary than to the athletic individual. — P. G. Stiles.

AN EXAMINATION OF THE MECHANICAL EFFICIENCY OF A HEALTHY ADULT BY HIS CO_2 DISCHARGE. *A. D. Waller* and *G. De Decker*. Jour. Physiol. (Proc. Physiol. Soc.), Sept. 5, 1919, 53, Nos. 1 and 2, xxx-xxxi. — The efficiency is figured first for the bicycle ergometer and second for stair-climbing. With the bicycle the net efficiency ranges from 20.8 to 26.8 per cent., increasing with the rate of performance. For stair-climbing (5 ascents of 20 metres) it reaches 32 per cent. — P. G. Stiles.

THE PHYSIOLOGICAL COST OF MARCHING MEASURED BY CO_2. *A. D. Waller*. Jour. Physiol. (Proc. Physiol. Soc.), Sept. 5, 1919, 53, Nos. 1 and 2, xxiv–xxvi. — The evolution of CO_2 by two soldiers moving round a track is about as follows: marking time, 16 c. c. per second; marching 3.4 miles per hour, 16 c. c. per second; 3.9 miles per hour, 22 c. c. per second; 5.9 miles per hour (double time), 35 c. c. per second; 7.2 miles per hour, 57 c. c. per second. The resting figure is 5 c. c. per second. — P. G. Stiles.

THE PHYSIOLOGICAL COST OF TAILOR'S WORK MEASURED BY CO_2 AND EXPRESSED IN CALORIES. *A. D. Waller* and *G. De Decker*. Jour. Physiol. (Proc. Physiol. Soc.), Feb. 20, 1920, 53, No. 5, lxxiii–lxxiv. — The metabolism of men and women engaged in the tailor's trade has been measured by the use of portable bags to collect the expired air. The average cost above the basal level is given as 463 Calories for an eight-hour day. This is less than one-fifth the figure previously obtained for a dock laborer. — P. G. Stiles.

ENERGY LOSS OF YOUNG WOMEN IN LIGHT HOUSEHOLD WORK. *F. G. Benedict* and *Alice Johnson*. Proc. Am. Phil. Soc., 1919, 58, 89–96. Abstracted as follows in Physiol. Abstr., Jan., 1920, 4, No. 10, 454. — "The average of 23 calorimeter experiments gave the resting metabolism as 1.12 cal. per kilo per hour. The increases over this by standing up, reading aloud, sewing, singing, dusting, sweeping, etc., are given in detail; they vary from 1 to 150 per cent., the increase being proportional to the labour involved." — McKeen Cattell.

THE INFLUENCE OF ALCOHOL ON MANUAL WORK AND NEURO-MUSCULAR CO-ORDINATION. *H. M. Vernon*. Medical Research Committee Special Report Series, No. 34, 1919. Abstracted by J. C. D. as follows in Physiol. Abstr., Oct., and Nov., 1919, 4, Nos. 7 and 8, 341. — "The influence of alcohol on manual work and on neuro-muscular co-ordination was investigated in 8 men and 5 women. The number of mistakes in a typewriting test was increased after the alcohol. The degree of effect depended largely on whether the alcohol was taken on an empty stomach or with food. Similar results are recorded in target-pricking tests. Experiments with claret and with pure alcohol of equal alcoholic strength showed that claret was slightly the more toxic." — McKeen Cattell.

THE EFFICACY OF THOROUGHLY DRYING CLOTHES. *Leonard Hill* and *D. H. Ash*. Jour. Physiol. (Proc. Physiol. Soc.), Feb. 20, 1920, 53, No. 5, lxxi–lxxii. — Dried fabrics of many kinds show a marked rise of temperature (4–6°C) when they are plunged into water or saturated air. Thus the cooling effect of perspiration may be exchanged for a warming effect when the skin comes in contact with dry garments or blankets. — P. G. Stiles.

OUTPUT OF WOMEN WORKERS IN RELATION TO HOURS OF WORK IN SHELLMAKING. *Ethel E. Osborne*. A STUDY OF IMPROVED METHODS IN AN IRON FOUNDRY. *C. S. Myers*. Reports Nos. 2 and 3 of the Industrial Fatigue Research Board (Medical Research Committee). H. M. Stationery Office, 1919. Abstracted by W. D. H. as follows in Physiol. Abstr., Oct., and Nov., 1919, 4, Nos. 7 and 8, 302. — "Both of these valuable reports, so opportune at the present time, coincide in recording that lessened hours of work means increase of output. The absence of undue fatigue is the great factor in this result." — McKeen Cattell.

FATIGUE RESEARCH IN TINPLATE MANUFACTURE. Chem. and Metall. Engin., Feb. 4, 1920, 22, No. 5, 223–225. — Abstracts from the *Iron and Coal Trades Review*, Sept. 12, 1919, p. 336. This article, which contains a report on the operations connected with the manufacture of tinplate in South Wales, was abstracted from *Engineering*, Vol. 108, No. 2806, p. 484, in a previous issue of the JOURNAL OF INDUSTRIAL HYGIENE (1919–1920, Vol. 1, p. 149). — G. M. Fair.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

Experiments on Acclimatisation to Reduced Atmospheric Pressure. *J. S. Haldane, A. M. Kellas,* and *E. L. Kennaway.* Jour. Physiol., Dec. 3, 1919, 53, Nos. 3 and 4, 181–206. — The observers, who were also the subjects of these trials, experienced the effects of rarefied atmospheres in a steel chamber. The barometric pressure was reduced to correspond with various altitudes, on one occasion to 295 mm. Hg which is equivalent to 26,500 feet. This was near the limit of endurance as shown especially by mental lapses. On four successive days two of the investigators remained eight hours in the chamber, each day under a lower pressure than before. Some acclimatisation was certainly secured. This was demonstrated by increasing power to sustain exercise. It was correlated with a diminution of urinary acid and ammonia. This points to a lowering of blood alkali to keep pace with the concurrent lowering of CO_2. The chief factor in acclimatisation is believed to be a secretory power acquired by the pulmonary epithelium. — P. G. Stiles.

Acclimatisation to Low Atmospheric Pressures. *J. S. Haldane, A. M. Kellas,* and *E. L. Kennaway.* Jour. Physiol. (Proc. Physiol. Soc.), 1919, 53, xlvi–xlvii. Abstracted by W. D. H. as follows in Physiol. Abstr., Oct., and Nov., 1919, 4, Nos. 7 and 8, 322. — "Experiments in a steel chamber caused partial acclimatisation, attributed to increased secretory activity of the alveolar epithelium. Increased breathing due to anoxemia produces an alkalosis. The supposed acidosis at great altitudes is only the compensation for the alkalosis. This requires time, and disappears at normal pressure, so exposure to a low pressure for some hours per diem is only partially effective in producing acclimatisation. Mere increase of breathing or of the circulation is ineffective in relieving anoxemia unless the alkalosis is relieved also, for the alkalosis lessens the dissociation of HbO in the capillaries, and thus neutralises any relief which would otherwise be produced." — McKeen Cattell.

HEAT, COLD AND HUMIDITY

The Optimum Humidity for Mental Work. *W. H. Burnham.* The Pedagogical Seminary, Dec., 1919, 26, No. 4, 311–329. — There is a wide range of opinion about the importance of humidity, some thinking that humidity has no effect upon health, others that it is a very important factor. The problems of temperature and of humidity are inseparable, and we have to deal not only with absolute humidity, but with relative humidity — that is, the relation of absolute humidity to the possible humidity. A study of the available literature leads the writer to believe that very low and very high humidity are both injurious to health, and that optimum humidity is dependent upon temperature. There is probably an optimum humidity for the best physical condition and for effective mental work, although it is likely that the range is wide. There is no consensus of conclusions. For a temperature of 20°C. Rubner advises a humidity of 30 to 60 per cent.; Uffelman, a humidity of 40 to 75 per cent. In this country we may well adopt a relative humidity of 45 to 65 per cent. as optimum. The range of comfort is wider — from perhaps 45 to 75 per cent. Although experimental evidence is slight, it seems clear that an optimum humidity is an important condition of efficient brain activity. — G. E. Partridge.

WOMEN AND CHILDREN IN INDUSTRY

The Case for Mothers' Pensions. *H. Scurfield.* The Child, Feb., 1920, 10, No. 5, 193–195. — "When a woman gives up the occupation for which she has been trained in order to get married, has a family and is then left a widow, the only thing which prevents her going back to her previous occupation, for which she was trained, is her children. It seems, therefore, equitable that the community should pay her for the work she does in bringing up

her children until they are fit to work for themselves, and that this payment should be free from any stigma of pauperism or charity."

The state should make an allowance for each child in every family, exceeding the number of four, under the school-leaving age. We need not concern ourselves much about the declining birth rate until we have made a proper effort to provide for the children that come into the world now, and have made provisions to abolish the widespread evil of child poverty. — G. E. Partridge.

WOMEN IN TRANSPORTATION IN NEW YORK CITY. U. S. Bur. Labor Statis., Month. Labor Rev., Dec., 1919, 9, No. 6, 290–292. — This article gives a summary of the findings of the New York State Industrial Commission which investigated the employment of women in the street, subway, and elevated lines of Greater New York in 1919. The investigation was carried on to anticipate, as far as possible, the probable effects of the enforcement of an act affording women the same protection as existing laws gave them in factories and department stores. The greatest opposition to the act came from the women themselves, who complained that through its enforcement their wages would be considerably reduced. The transportation companies in general had found the employment of women satisfactory, but it would be difficult for them to readjust themselves to meet the requirements of the proposed act. In spite of all opposition the act was enforced, with the result that most of the women were soon after discharged or sent to booths as ticket sellers at reduced wages. — R. B. Crain.

WOMEN WORKERS IN CHINA. American Economist, Jan. 30, 1920, 65, No. 5, 76. — Great numbers of Chinese women are entering industrial life. In Shanghai about 70 per cent. of workers in the cotton mills are women and children. Working hours for spinners are from 6 in the morning until 6 at night, or from 6 at night to 6 in the morning. Weavers work from 5.30 in the morning until 7 at night and the wages are from 10 to 20 cents per day. In Canton there are 150,000 women in factories at a maximum wage of 40 cents per day. — G. E. Partridge.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

INDUSTRIAL LIGHTING CODES. *G. H. Stickney.* Electrical World, Feb. 14, 1920, 75, No. 7, 378–379. — Industrial lighting codes, fairly uniform in essential features, are now in force in six states, two having been added during 1919. The codes do not pretend to be in a final state. Probably the first need will be a more definite specification as to glare limits. This, however, must await the invention of a suitable instrument for the measurement of glare. — G. M. Fair.

THE FUNDAMENTAL PRINCIPLES OF ILLUMINATING DESIGN. Am. Arch., Feb. 25, 1920, 117, No. 2305, 261–263. — A discussion of the elements of light and light measurement. — G. M. Fair.

MAINTENANCE OF INTERIOR LIGHTING SYSTEMS. *A. L. Powell.* Electrical Rev. (Chicago), Feb. 14, 1920, 76, No. 7, 263–266. — The proper maintenance of lighting equipment is a very important factor in illumination. Lamps should be discarded when the candle power has depreciated to 75 per cent. or 80 per cent. of the initial rating. The Mazda lamp is designed to maintain its candle power above these limits for an average burning period of 1000 hours. The accumulation of dust and dirt on the outside of the lamp and reflector is more serious than often realized. Proper voltages should be used to secure maximum efficiency of lamps, and all lamps and reflectors should be regularly washed. The question of color of walls and ceilings is very important. In general, paint is cheaper than electrical energy and in dirty plants painting or cleaning is especially recommended. Methods of systematic cleaning and studies of energy and cleaning costs are given. — G. M. Fair.

AIR CONDITIONING IN THE INDUSTRIES. *E. E. Leason.* Chem. and Metall. Engin., Feb. 11, 1920, 22, No. 6, 279–280. — A discussion of air conditioning in its relation to better health and improved manufacturing in the dye indus-

tries, candy factories, the baking industry, photography, lithography, and other lines of industry. — G. M. Fair.

Ozone as the Solution of the Fresh Air Problem. *E. S. Hallett.* Heat. and Vent. Mag., Feb., 1920, 17, No. 2, 25–26. — The writer sees in the use of ozone the solution of the fresh air problem. As a result of a year's test of ozone apparatus used in connection with the heating and ventilating of St. Louis schools, he comes to the conclusion that ozone destroys all odors resulting from human respiration and clothing; it produces mild exhilaration; removes toilet room odors and smells due to lodgment of dust in ducts; it has no odor itself when used in proper concentrations; it reduces weight in persons corpulent from inactivity, etc. — G. M. Fair.

Science and Art of Heating. *T. N. Thomson.* Plumbers' Trade Jour., March 1, 1920, 68, No. 5, 341–342. — This article, the first of a series on this subject, discusses the various types of heating systems in general, and explains the names and uses of the several parts of a heating system. — G. M. Fair.

The Prevention and Care of the Red Water Plague. *William H. Walker.* Plumbers' Trade Jour., Feb. 1, 1920, 68, No. 3, 178–180. — This paper read before the New England Water Works Association has already been reviewed in a previous issue of the Journal of Industrial Hygiene (1919–1920, Vol. 1, p. 178). — G. M. Fair.

Prevention of the Red Water Plague. Engin. N.–Rec., Feb. 19, 1920, 84, No. 8, 381. — Abstracts of a paper by *W. H. Walker* read before the New England Water Works Association and reported in a previous issue of the Journal of Industrial Hygiene (1919–1920, Vol. 1, p. 178). — G. M. Fair.

Studying Manufacturing Wastes in Connecticut. Pub. Works, March 13, 1920, 48, No. 9, 184–186. — A discussion of studies made in Connecticut on reducing pollution from plants engaged in manufacturing with metals, including recovery of metals from the waste and prevention of nuisance. The view of the Connecticut State Board of Health concerning disposal by dilution is given. — G. M. Fair.

Science and Art of Plumbing. *T. N. Thomson.* Plumbers' Trade Jour., March 1, 1920, 68, No. 5, 333–334. — As the first of a series of articles on the science and art of plumbing, this article gives a definition of common plumbing terms and an explanation of the different lines comprising a plumbing system. — G. M. Fair.

Design of Sewage-Purification Works. *A. C. Hewitt.* Abstracted from Commonwealth Engin., 1919, 6, 308–312 by H. C. Colson, Jr., in Chem. Abstr., Nov. 20, 1919, 13, No. 22, 2945. — "Difficulties encountered in designing purification works for small communities with especial reference to conditions in Australia are discussed. It is more difficult to secure a first-rate effluent at a reasonable cost in small community plants than in large ones. For primary treatment the septic tank, and for secondary treatment percolating filters with or without subsequent land treatment, is preferred. A suitable septic tank design for a small community (72 persons) is described in detail, accompanied by illustrations, together with percolating filter design and pump well." — W. O. Fenn.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

The Surgeon in Relation to Public Utilities. Part I. *Charles M. Harpster.* Mod. Med., Aug., 1919, 1, No. 4, 301–307. — An account of the organization of the medical department of the Toledo Railways and Light Company. A plan of the medical service department of this company is given, together with photographs of equipment. Examination forms of elaborate type are presented and their value commented upon. Actual data relative to the utility of the work accomplished appears in the continuation of this article in a subsequent number of the journal. — C. K. Drinker.

Employees' Hospital of Fairbanks, Morse & Company. *C. F. N. Schram.* Mod. Med., Aug., 1919, 1, No. 4, 322–324. — This brief article presents the distribution and char-

acter of surgical injuries occurring during the year 1918 among the employees of Fairbanks, Morse & Company, a summary of which follows: number of employees, 3500; number of injured employees, 9409; number of redressings, 37,742; number of cases of illness, 4084. A diagram is given showing the relative regional occurrence of these injuries to be: head, 280; eye, 2377; trunk, 120; arm, 274; wrist, 295; hand, 5512; lower extremity, 148; foot, 403. In another diagram it is shown that lacerations constituted 34 per cent. of the injuries; foreign bodies, 28 per cent.; abrasions 11 per cent.; contusions 10 per cent.; punctures 3 per cent.; burns 5 per cent.; miscellaneous, 9 per cent. Unfortunately similar data are not given for medical work. — C. K. Drinker.

Medical Service for Employees and Families at the Endicott Johnson Corporation. *L. D. Fosburg.* Mod. Med., Aug., 1919, 1, No. 4, 308–310. — A statement of the organization and the general manner of operation of the medical department in this corporation. — C. K. Drinker.

Seven Years of Industrial Medical Service for Montgomery Ward Employees. *Jeannette D. King.* Mod. Med., Aug., 1919, 1, No. 4, 316–321. — This article presents certain details of the operation of the medical service in this company, the most important of which are: Each department sends the names of absentees from illness to the medical department before 9 o'clock each day. If such employee wishes the doctor to call, a doctor is sent the same day; if he does not wish medical attention but fails to return to work on the second day, the visiting nurse makes the call. The visiting nurse also follows up all doctor's calls and gives bedside care when necessary. All hospital cases are sent to one institution since, in this way, they receive much better care than if sent to a number of different hospitals.

Physical examinations precede employment and permit utilization of cripples in certain jobs. Individuals found to be losing weight and reported to the medical department by members of the woman's club are looked over carefully and placed upon "the malted milk list," receiving thereafter an eight-ounce glass of malted milk between 9:30 and 10:30 o'clock in the morning, and between 2 and 3 o'clock in the afternoon. Such individuals are frequently weighed and are always under observation so that early tuberculosis is readily detected.

Six dentists are employed and serve the employees at cost. The statement is made that "75 per cent. of our sicknesses are the result of infections in the teeth." This is such an extraordinarily high percentage as to cause some skepticism in regard to diagnoses. — C. K. Drinker.

Simple Health Literature for Employees. *Edwin A. Hunger.* Mod. Med., Aug., 1919, 1, No. 4, 321. — A statement of the health instruction pamphlets issued by the Eastman Kodak Company of Rochester, N. Y. — C. K. Drinker.

INDUSTRIAL NURSING

Industrial Nurse's Responsibilities and Opportunities. *Florence S. Wright.* Safety Engin., Oct., 1919, 38, No. 4, 221–222. — The responsibilities of an industrial nurse are summed up in the following:

1. To herself, that she develop her powers.
2. To her employers, that she perform faithfully what they have seen for her to do, while demonstrating the economic value of broader activity.
3. To the workers, that she serve them acceptably and with the authority that will win their heed to her teaching.
4. To the industrial physician, that she carry out his medical orders exactly and that she cooperate with him in all matters.
5. To the community, that she act in the best and broadest meaning of the term as a good and progressive civic as well as industrial servant.

The industrial nurse can best meet her responsibilities and seize her opportunities "by co-operation with her employer, who, if she gives evidence of ability and if she is careful to show by means of facts, through her records and reports, the wisdom and economy of each step she takes, will allow her reasonable initiative and freedom to co-operate with other department heads in the plant and who will aid all she does to become an efficient employee, a helpful friend to her fellow workers and a capable assistant to the industrial physician." — R. M. Thomson.

INDUSTRIAL PERSONAL AND COMMUNITY HYGIENE: HOUSING, ETC.

The Model Town of Truxton. *W. H. Jennings.* The Southern Workman, Feb., 1920, 73–78. — Truxton is a town of 200 colored families in Virginia. It was constructed by the United States Housing Corporation. The houses are well built, of two stories, each house with five rooms and bathroom, and differing in exterior enough so that two houses alike are hard to find. Arrangements are being taken up for the purchase of the houses by the occupants on an easy-payment plan. The streets and sidewalks of the town are made of crushed and pulverized stone, and are arranged with reference to pleasing appearance. The absorbent sanitation system first tried failed, and now a sewage system with a connection for each house has been installed. The town has aroused interest and is being observed closely by large employers of negro labor throughout the United States. — G. E. Partridge.

INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS: SPECIAL TESTS IN THE SELECTION OF EMPLOYEES

University Students' Intelligence Ratings According to the Army Alpha Test. *E. L. Noble* and *G. F. Arps.* School and Society, Feb. 21, 1920, 11, No. 269, 233–237. — Students of Ohio State University to the number of 5930 took the army tests. All the work was completed within three weeks of the date of examination. Tables show the distribution of cases according to college years; percentile ranks, sex differences and other data are given. The article is useful for purposes of comparison and contains suggestions in regard to group-testing. — G. E. Partridge.

INDUSTRIAL SERVICE AND MUTUAL BENEFIT ASSOCIATIONS

The Economic Value of Company Clubs. National Association of Corporation Schools Bulletin, Feb., 1920, 7, No. 3, 123–139. — A recent survey made by the Bureau of Labor shows that 127 firms, employing a total of 813,-904 workers, provide for their employees club rooms or club houses of some kind. These clubs range all the way from small single rooms in the plants to elaborate separate buildings. There are many types of clubs: Y. M. C. A., benefit associations, technical associations, and boys' and girls' clubs such as boy scouts. In some places there are provisions for racial associations. The equipments include libraries, gymnasia, musical instruments, recreational apparatus of various kinds. Some firms maintain country clubs and camps where workers can spend vacations, week-ends and holidays. — G. E. Partridge.

Community Service for the Negroes of the Lower Virginia Peninsula. The Southern Workman, Feb., 1920, 65–69. — This is a report of the development of community service from the war-camp community service in Newport News and Hampton. Communities are taking over the war-camp equipment at a small rental. The article contains a description of war-camp activities. — G. E. Partridge.

MALINGERING

Malingering. *Joseph Catton.* Mil. Surgeon, Dec., 1919, 45, No. 6, 706–717. — Catton asserts that out and out malingering is exceedingly rare but the minor forms, such as exaggeration and prolongation of illness, are quite common, especially in persons who are not normal mentally. Malingering should be looked for carefully in order that fraud may not be a drain on the efficiency of the military organization or upon the funds for hospitalization or compensation. The diagnosis of frank malingering should not be made until organic disease has been ruled out, hysteria eliminated, and proof of fraud demonstrated objectively or by the confession of the patient, nor until psychiatric examination has shown the absence of psychoneuroses, psychoses, inebriety, mental deficiency, and constitutional psychopathy. — H. A. Bulger.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

WORKMEN'S COMPENSATION. Eighth Annual Report of Industrial Commission of Wisconsin, July 1, 1918, to June 30, 1919, 80. — The eighth annual report of the Industrial Commission of Wisconsin states briefly the nature of the cases coming to the attention of the commission, the amendments to the compensation act, the contested cases, and the policy of the commission in regard to compensation insurance. Statistical tables are appended. Fifty pages are devoted to a discussion of the awards under the compensation act. — L. A. Shaw.

OCCUPATIONAL DISEASES UNDER WORKMEN'S COMPENSATION LAWS. *Carl Hookstadt.* Mod. Med., Aug., 1919, 1, No. 4, 311–315. — Physical impairment produced by slow development of a disease that has its origin in the processes of an industrial occupation is no less an injury than the disability caused by accident. This broad interpretation of the term injury is recognized in Great Britain, Argentina, Brazil, New South Wales, Switzerland, the Union of South Africa, and Canada, with the exception of Quebec and Saskatchewan. In the United States, however, only six workmen's compensation jurisdictions (California, Connecticut, Hawaii, Massachusetts, Wisconsin, and the federal government) provide compensation for occupational diseases. State compensation laws which do not accord full recognition to this principle need enlargement to include occupational diseases. — C. K. Drinker.

INSURANCE FACTS FOR EMPLOYMENT MEN. *Harry W. Kimball.* Ind. Management, Jan., 1920, 59, No. 1, 73–75. — Mr. Kimball calls attention to the "five major hazards to which almost all workers are liable" — death, sickness, accident, old age, and non-employment. In the case of accidents it is suggested that compensation granted by the state is usually inadequate. In some instances this inadequacy is overcome by employers supplementing the compensation. Mutual benefit societies are playing an even more important part in adding to the worker's income during incapacity.

Much constructive work has been done to reduce illness; however, in spite of health campaigns, workers are still subject to loss of time from this cause. Here again the mutual benefit association plays an important part. In some cases employers share in the expense of health insurance for their workers. In the case of the hazard of death, industrial concerns can do much by encouraging and advising with employees in taking out insurance with reliable companies. In many instances concerns are supplementing this form of protection by a group-insurance plan.

In connection with unemployment, the writer suggests that it is just as proper for a company to lay by funds to protect its workers against unemployment as it is to establish a fund to provide dividends during slack times. — C. H. Paull.

COMPULSORY SICKNESS INSURANCE A MENACE. Am. Industries, Feb., 1920, 20, No. 7, 37–38. — This is a résumé of the recommendations of a special committee of the Medical Society of the State of New York. The report of this committee calls attention to:

1. Most illness leading to poverty is of long duration and usually extends beyond the period of twenty-six weeks for which benefits are provided.

2. The medical service provided under the insurance scheme is already being rendered more satisfactorily by physicians under the system of private practice.

3. Under a system of sickness insurance the morale of the medical profession tends to deteriorate.

4. The new scheme of public health administration would tend to destroy the existing machinery of health administration which has been found to be effective.

In view of these and other considerations the committee recommended that a sufficient appropriation be given the state health departments to permit them to establish the exact relation between character of illness and economic condition. — C. H. Paull.

ABSTRACT OF THE LITERATURE

OF

INDUSTRIAL HYGIENE

VOLUME II JULY, 1920 NUMBER 3

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GENERAL

CLINICAL TYPES OF OCCUPATIONAL DISEASES: STUDY OF METHODS FOR THEIR PREVENTION. *Louis I. Harris.* Jour. Am. Med. Assn., Sept. 20, 1919, 73, No. 12, 880–886. — Industrial hygiene, industrial surgery, and industrial medicine have begun to emerge clearly into view as most important special branches of modern medicine. The sources of danger to the lives and health of workers are adequately illustrated in this article by examples of carbon monoxide poisoning, carbon dioxide poisoning, anthrax, and various other forms of chemical poisoning.

Practically all the medical schools have thus far failed to include in their curriculum the study of industrial hygiene and of occupational diseases. The medical clinics which are connected with universities for teaching purposes should utilize to better advantage than they now do the wealth of clinical material available for the study of occupational diseases. A great opportunity for the study of occupational diseases likewise presents itself to physicians who are employed by various industrial corporations and in connection with whose work a variety of health hazards exist. It is a deplorable fact, however, that the great majority who accept employment as factory physicians are content to conduct what are essentially merely dispensaries for the purpose of rendering emergency service in cases of accidents. In only a few instances have state or municipal health officers included the subject of industrial hygiene and the prevention of occupational diseases in their programs.

Taking the country by and large, there is little evidence that labor organizations have even begun to appreciate that the campaign for the protection of the health of those in industry is quite as vital to their interests as

better wages and shorter hours, to the procurement of which they have thus far limited practically all their efforts.

The future development of industrial hygiene and medicine hinges on a reform of the curriculum of the respective medical schools and on the sympathy and willingness of private physicians and hospitals to aid in protecting the public welfare. It is essential, too, that there should be co-operation between the different state and federal health organizations and, what is even more important, there must be authoritative leadership. — L. A. Shaw.

Industrial Hygiene. Med. Times (London), 48, No. 2113. — This editorial comments upon the fact that although industrial medicine and surgery constitute an integral part of industry, the health of industrial workers has not received in the past the attention that it should have. During the war much good research work was done and some attempt is being made to continue it. The efforts of the Factory Branch of the Home Office have resulted in many important advances in industrial hygiene. America is ahead of us in this field, but there is no reason why Britain should lag behind. The article advocates the establishment of a health committee in every factory. Co-operation between employer and employee is essential. — A. F. Kent.

The Johns Hopkins University School of Hygiene and Public Health. Quart. Bull. Louisiana State Board of Health, Dec., 1919, 10, No. 4, 220. — The Johns Hopkins University School of Hygiene and Public Health announces its first intensive course of instruction to meet the needs of public health officers and of physicians proposing to enter upon public health work. — L. A. Shaw.

The Owen-McDuffie Bill for the Creation of a Department of Public Health. Educational Record, Jan., 1920, 1, No. 1, 15–16. — An outline of the proposed bill (S. 814 and H. R. 5724) to create a Department of Public Health, with a secretary in the Cabinet and an assistant secretary. The department will have a Bureau of Sanitary Research, Bureau of Child Hygiene, Bureau of Vital Statistics, Bureau of Food and Drugs, Bureau of Quarantine, Bureau of Sanitary Engineering, Bureau of Government Hospitals, Bureau of Personnel and Accounts. Ten million dollars are to be appropriated for co-operation with the states in promotion of public health on condition that the states match the appropriation. — G. E. Partridge.

War-Time Revelations in Physical Education. *T. A. Storey.* Am. Physical Education Rev., Feb., 1920, 25, No. 2, 47–52. — The state of peace-time physical education has been deplorable, as was shown by the generally poor habits of constructive hygiene found in our soldiers. Less than 5 per cent. of our young men and women have received physical education in school. At least 50 per cent. of the population need some reparative or corrective hygiene. At the present time only twelve states require any form of physical education in the school. To meet some of these conditions the U. S. Interdepartmental Social Hygiene Board has laid out a program for assisting in the establishment of departments of hygiene in normal schools and other educational institutions. — G. E. Partridge.

The Training of Physical Educators. *C. W. Hetherington.* Am. Physical Education Rev., Feb., 1920, 25, No. 2, 61–62. — "We must conceive a physical education as the constructive educational source of organic development and therefore health; the source of the fundamental phases of character, discipline and moral training; and the source of skill at the foundation of all efficiency. It is the foundation of all education; the rest is the superstructure and must be built on a solid foundation of physical education." — G. E. Partridge.

Survey of Guelph Public Schools. *C. K. Clarke* and *C. M. Hincks.* Canad. Jour. Ment. Hyg., Jan., 1920, 1, No. 4, 342–346. — Out of a school population of 2245, it was found that 3.34 per cent. had an intelligence quotient of 75 per cent. or less. For these seventy-eight patients special industrial classes were recommended, in which the curriculum should comprise academic work, handiwork, games, gymnastics, etc. This was done in an endeavor to develop each child to the limit of his capacity and to train him in healthy physical, mental and moral habits. — S. Cobb.

Vocational Psychology. *E. Stern.* Zeitschrift für die gesamte Neurologie und Psychiatrie, Feb., 1920, 20, No. 2, 87–115. — The

writer undertakes to present a brief summary of the development of vocational psychology, giving the credit for its beginning to Münsterberg, followed in Germany by Stern and Lipmann. A section is given to the Moede-Piorkowski-Wolff tests used in the Berlin schools in distributing children from the lower to the higher schools, and to similar applications of psychology. The psychological characteristics of occupations, attention-types, etc., are mentioned. The author divides the problems of vocational psychology into two groups: the problem of testing an individual with reference to placing him in the most suitable occupation, and, secondly, the problem of deciding whether an individual is suited for a certain occupation. In one case the man is given, in the other the occupation, as the starting point. Stern reports in summary his own tests for aviators.

The article is a useful guide to recent German literature in the field and may well be read in connection with the earlier and more elaborate analysis of the field of occupational psychology by C. Piorkowski, *Beihefte zur Zeitschrift für angewandte Psychologie und psychologische Sammelforschung*, ii, 1915. — G. E. Partridge.

An Experiment to Determine the Relation of Interests to Abilities. *R. Hartman* and *J. F. Dashiell.* Psychological Bulletin, Aug., 1919, 16, No. 8, 259–262. — There still exists, in regard to the problem of vocational guidance, much doubt about the relation between interests and abilities in the activities in which the interests lie. Upon this subject we need exhaustive studies from several points of view. In the writers' experiments tests were made, such as the word-completion test, code writing, tests for retention, arithmetical problems, pitching pennies, letter cancellation, and the subject was asked to record the degree of his interest in the tests. A positive correlation of .243 was found between ability and interest. The highest correlation for the total work of an individual was .915. — G. E. Partridge.

The Social Unit Plan as a Means of Democratizing Social Work. *E. T. Devine.* The Journal of Delinquency, Jan., 1920, 5, No. 1, 9–14. — For two years and a half the National Social Unit Organization has experimented in community organization in the Mohawk-Brighton District in Cincinnati, Ohio. The district has a population of 15,000. Here all residents take part or may take part in the block-councils, elect block-workers, etc. Prospective beneficiaries are consulted in advance about their needs. In the block-councils projects are decided upon, and then experts are called in to determine ways and means. All the agencies engaged in field work in the district regard the intensive block-organization as successful. The result of the system is especially that all cases become thoroughly discussed in the Social Workers' Council, and in this way the social agencies of the city have been brought closer and made more accessible. — G. E. Partridge.

The Social Service Problems of the Jewish Immigrant. *David H. Fauman.* Canad. Jour. Ment. Hyg., Jan., 1920, 1, No. 4, 323–328. — Racial peculiarities and their results are discussed in the light of the history of the European Jew, as are also the effects of sudden emancipation in a new country both on the adults who have immigrated and on the children born in the new environment. — S. Cobb.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

Malignant Tumors of the Bladder in Workers in the Organic Chemical Industry. *Max Nassauer.* Abstracted as follows from Z. angew. Chem., 1919, 32, 333–335, by J. S. Hepburn in Chem. Abstr., March 20, 1920, 14, No. 6, 777–778. — "Malignant tumor (cancer) of the bladder occurs as an occupational disease among workers who come in contact with aniline vapors. The occurrence of this disease among workers engaged in the manuf. of benzidine is probably due to the aniline, 4 to 5% of which is formed as a by-product. The disease is produced only if the aniline be inhaled as a highly dild. gas; solid benzidine did not produce disease of the bladder when introduced in the dry powdered state into the digestive canal and the respiratory tract. The workmen attacked by the cancer

have not been engaged in evapn. or distn. of pure benzidine, but have been employed in adjoining buildings of the factory or in the open air, and have inhaled the aniline vapors highly dild. with air. The poison, inhaled in very small amts., is dissolved in the moisture of the alveoli, and enters the cells and the lymph or blood streams without producing direct symptoms of intoxication. Since aniline is comparatively easily sol. in water to a 3% soln., while benzidine is scarcely sol. in water and quite insol. in the salt-containing fluids of the cells, aniline, and not benzidine, must be the poison. Moreover, tumor of the bladder has not been noted among workmen who have been exposed for 20 and more years to extremely fine dust of aniline-free benzidine. The poison is oxidized or otherwise altered in the animal body, and the products are excreted, in part, by the feces, urine and perspiration; however, a portion of these products remains in some, as yet undetd., part of the body, and, after the lapse of time, attains a certain threshold, and stimulates the epithelium of the bladder to the formation of new cells and malignant growth. A workman may be employed on the av. for 16 years before the first symptoms of the disease appear. Of the operations for tumors of the bladder made at the surgical clinic of the Univ. of Frankfurt during a period of 23 years, from 25 to 30% were for tumors produced by aniline." . . . Methods for the proper ventilation are described. "As to personal hygiene, workmen with either constitutional or cutaneous diseases must not be employed. Employes suffering from even the slightest attacks of diseases and injuries of the skin and air passages should cease work until completely recovered. The urine of each workman should be examd. at intervals of 8 days. . . . Employes, in whom, in the absence of other diseases of the urinary system, even the slightest leucocyte content appears in the urine, must be removed from the plant permanently, and must work in the country air, and be continually under the observation of a specialist in urology. Workmen may not labor for longer than 3 months in plants in which they are exposed to the poisoning." — W. O. Fenn.

MENTAL

THE RECOGNITION AND BETTER TREATMENT FOR MENTAL NERVOUS INJURIES. *Francis D. Donoghue.* Mod. Med., Dec., 1919, 1, No. 8, 671–674. — "The volitional index of a patient determines the degree of co-operation that may be counted upon in bringing him back to efficiency. Psychic fear, with or without physical injury, may induce a set of inhibitions most baffling to control. With the possibility of compensation, there is added the question of motives which further confuses the issues. The care of such cases constitutes one of the most difficult problems of accident boards, and their classification demands the most impartial consideration of the scientific mind." — A. B. Emmons.

THE SMITH COLLEGE EXPERIMENT IN TRAINING FOR PSYCHIATRIC SOCIAL WORK. *W. A. Neilson.* Reprinted from Ment. Hyg., Jan., 1919, 3, No. 1, 59–64. — This paper describes the experiment undertaken at Smith College in the summer of 1918 in establishing a method for training psychiatric social workers for wartime needs, and outlines the scheme in preparation for continuing this training to meet the requirements of peace times. "How long the work will be continued, how far it will be developed, depends entirely upon the reception given to the products of the school by the profession, and the supply of material." It is anticipated that before long the value of the profession will appear so obvious to the community at large that the demand will greatly exceed the supply. — M. C. Shorley.

THE MENTALITY OF CONVALESCENCE. *E. A. Bott.* Canad. Jour. Ment. Hyg., Jan., 1920, 1, No. 4, 302–312. — Much can be done by directly interviewing patients during convalescence in order to get into personal touch with them and understand their personal problems, as well as to impress and stimulate them. For each negative element of the mentality of convalescence "is substituted a positive one based on powerful emotions which the veteran knows. Instead of allowing the patient to relinquish responsibility he is forced to assume it by having him measure up to expectation in working out his own salvation day by day. His extreme suggestibility is taken advantage of to impress a constructive programme stimulated by the instincts of sport and competition. His false idealism which would forget the facts and look for relief to something outside or beyond reach is banished by converting him to an enthusiastic use of practical means at hand. Lastly, his strong gregarious habits are utilized to cultivate an atmosphere of cure

rather than of convalescence. Establish the conviction of improvement in individuals and it will spread through a whole patient population, then collective treatment may complete the process."

"Among the problems of the future therefore will be the proper balancing and interrelating of technics that will be most appropriate to convalescence in the widest sense. The mental attitude of patients in war service is complex, but is immeasurably simpler than the points of view met outside the service where patients of both sexes and all ages await similar assistance. To find the facts about the attitude of workers in industry, for instance, is a vital task to-day that is little more than commenced. If medicine, therefore, sees new service in the field of industry ought not the psychological factor to have a place in its programme and an influence on its therapeutic procedures ? " — S. Cobb.

Facial Expression as an Index of Mentality. *C. Burt.* Child-Study, June, 1919, 12, No. 11, 3. — Notwithstanding the practical importance of facial expression as a general indication of mental characteristics, there has been very little study of its validity or trustworthiness by the methods now in vogue for testing the diagnostic value of mental symptoms and reactions. Some preliminary experiments on the problem are reported in the above paper. In these tests estimates were made from the study of facial expression and general impression of the subjects in regard to twenty-nine qualities of character and intelligence, and these estimates were compared with judgments made by other observers on the basis of acquaintance with the subjects. Other calculations were made from the study of photographs. It was found that judgments based upon photographs are of little value as compared with those based upon direct observation of the face in movement, although some characteristics are reliably shown by the photographs. In direct observation judgments about general qualities (general physical vitality, general emotionality, general intelligence, and general moral character) are far more accurate than judgments about specific qualities. Physical and emotional qualities betray themselves in the face far more readily than qualities of intelligence or of moral character. Specific emotional qualities are much more easily diagnosed than specific intellectual qualities. "The power to read the face seems then, in part, at least, to involve a teachable technique." — G. E. Partridge.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

Industrial Poisoning in Chemical Manufacture. Review of War Years. *T. M. Legge.* Abstracted as follows from Chem. Trade Jour., 1919, 65, 385–388, 411–413; Chem. Age, 1919, 1, 465–467, by J. S. Hepburn in Chem. Abstr., March 20, 1920, 14, No. 6, 775–776. — "L., who is British medical inspector of factories, reviews poisoning and disease of an industrial origin occurring during 1915–1918, both inclusive. All risk of Pb poisoning lies in the inhalation of the dust or fume, and may be avoided if these be removed or prevented. Poisoning in the manuf. of P occurs chiefly in the condenser plant; improvements in handling the crude P and the P-mud reduce their exposure to the air, and the amt. of fume, and thereby decrease the liability to poisoning. Arsenic poisoning was produced by fumes of $AsCl_3$ which was made by distn. of a mixt. of As_2O_3, NaCl and H_2SO_4. Examn. of the hair and urine of workmen in this plant showed the presence of material amts. of As and indicated degenerative changes in the kidneys. The symptoms (ulceration of the skin) were those produced by dusts and salts of As. Poisoning by AsH_3 may occur in the chem. and dye industries from the action of Zn dust on HCl. Use of HCl free from As will decrease the danger, but the Zn may also carry As. The reaction should be carried out in an enclosed vessel in which a slight negative pressure is maintained, or an ample exhaust draught must be maintained at the vessel. Mercurial poisoning increased during the war as a result of the increased use of Hg fulminate in detonators. The symptoms produced were dermatitis, conjunctivitis, and inflammation of the nasal and laryngeal mucosa. Washing with a 10% soln. of $Na_2S_2O_3$ aided in the prevention of the rash and ulcers; use of a 2% soln. of this salt as an eye-wash proved beneficial. Toxic jaundice was produced by tetrachlorethane

(used as an airplane dope), trinitrotoluene, and dinitrotoluene. To prevent the poisonous action of dinitrotoluene, recourse was had to exhaust ventilation, personal cleanliness of the workmen, and daily examn. of their urine for the compd. Exposure to enveloping nitrous fumes for more than 2 min. produces asphyxiation and death. Exposure for 0.5 to 2 min., followed by apparent recovery on return to the open air, may cause pulmonary edema a few hours later with fatal termination. Daily exposure to small amts. frequently causes chronic bronchitis. Benzene vapors may give rise to acute poisoning with fatal results. Before a tank or other vessel which has contained benzene is entered, it should be thoroughly boiled with water while raking any sediment in it, then should be filled with water and emptied immediately before entry; a respiratory app. drawing its air supply from without the tank should be worn. In the manuf. of briquets with pitch, ulceration of the skin and of the cornea, and epithelioma may attack the workmen. Industrial dermatitis may occur in machine shops where cutting oils, sol. oils, and cutting compds. are used on lathes and similar machines. Inflammation of the hair follicles, septic infection, and eczema occur. The best preventative is cleanliness; for both prevention and cure, the hands and arms should be washed before and after work, then powdered with a mixt. of equal parts ZnO and starch. Various other irritants produce dermatitis." — W. O. Fenn.

Carbon-Monoxide Poisoning in Warfare. *W. J. Rutherfurd.* Lancet, Jan. 24, 1920, 198, No. 5030, 184–188. — A brief discussion of symptoms resulting among sappers from single exposure to gases following mine explosions, illustrative cases of which are cited. The CO content of various gas mixtures is given. No mention is made of chronic symptoms due to frequent exposure to small amounts of gas. — H. S. Forbes.

A Report of Five Cases of Poisoning by Nicotine. *William D. McNally.* Abstracted as follows from Jour. Lab. and Clin. Med., 1920, 5, 213–217, by E. R. Long in Chem. Abstr., April 10, 1920, 14, No. 7, 980–981. — "Three cases of nicotine poisoning following drinking of insecticide containing approx. 40% nicotine are recorded, in which no autopsy was made. In two other cases about 30 cc. of 40% nicotine soln., mistaken for whiskey, was imbibed, death following within 5 min. Intense hyperemia of the gastro-intestinal tract was noted at autopsy. The stomach of one contained 0.7702 g. nicotine, the other, 4.9609 g. The literature is reviewed and the methods of detn. are considered. . . ." — W. O. Fenn.

Poisoning by Gases from an Ammonia Factory. *Leybold.* Abstracted as follows from Jour. Gasbel, 1916, p. 256, and Zentr. Biochem. Biophys., 19, p. 285, by H. S. Paine in Chem. Abstr., March 10, 1920, 14, No. 5, 576. — "L. describes a case of fatal poisoning by gases (H_2S and HCN) evolved in the prepn. of $(NH_4)_2SO_4$." — W. O. Fenn.

Chronic Arsenic Poisoning from Drinking Water. *C. Alvarez.* Revista Médica del Rosario, Dec., 1919, 9, No. 5, 311. Abstracted as follows in Jour. Am. Med. Assn., Feb. 28, 1920, 74, No. 9, 636. — "Alvarez publishes two further cases of what he calls Bell-Ville disease, as the first cases of this chronic intoxication from arsenic-containing water were observed at Bell-Ville in northern Argentina. The new cases were in men of 25 and 62 and after abandoning the use of water from a certain well, both recovered completely from the severe clinical picture they presented at first. In the young man the liver was predominantly affected, and ascites required tapping twenty-one times. In both the skin showed dark pigmentation, with scattered white and black dots."

Mercurial Poisoning. *R. P. Albaugh.* Mod. Med., Nov., 1919, 1, No. 7, 562. — This article takes up very briefly the occurrence, symptoms, prevention, and treatment of mercurial poisoning. — L. A. Shaw.

Benzol Poisoning. *R. P. Albaugh.* Mod. Med., Dec., 1919, 1, No. 8, 670. — A brief statement of the symptoms, prevention, and treatment of benzol poisoning. —A. B. Emmons.

Non-Fatal Poisoning by Sodium Fluoride. *C. Vallée.* Abstracted as follows from Jour. pharm. chim., 1920, 21, 5–8, by S. Waldbott in Chem. Abstr., March 10, 1920, 14, No. 5, 577. — "Seven persons were poisoned partaking of some pastry, in the prepn. of which NaF was used by mistake in place of $NaHCO_3$. The amt. absorbed by each was about 0.228 g. NaF, except 0.456 g. in 1 case. Gastralgia, nausea and vomiting followed, the attack lasting 3 to 6 hrs., in the 1 case 12 hrs., followed by 36 hrs. of general weakness. Milk aided in the recovery." — W. O. Fenn.

DUST HAZARDS AND THEIR EFFECTS

DUST INHALATION AND MINER'S PHTHISIS. *H. W. Davies.* Abstracted as follows from Science Progress, 1919, 14, 329–330, by J. S. Hepburn in Chem. Abstr., March 20, 1920, 14, No. 6, 777. — "Miners who inhale silica dust are especially susceptible to tuberculosis, while miners who inhale coal dust are not especially susceptible to that disease. Inhalation of silica dust mixed with dust composed of coal or clay is relatively harmless. Expts. on guinea pigs showed that the dust was taken up by the epithelial cells in the alveoli of the lungs. With silica dust, these cells then remained in place, and gave rise to fibrosis and increased susceptibility to tuberculosis. After taking up the coal dust, and its mixt. with silica, these epithelial cells became detached and wandered out. Since addition of coal dust rendered the SiO_2 harmless, it is suggested that coal dusting be used in quartz mines to prevent miner's phthisis." — W. O. Fenn.

THE EFFICIENCY OF CERTAIN DEVICES USED FOR THE PROTECTION OF SAND BLASTERS AGAINST THE DUST HAZARD. *C.-E. A. Winslow, L. Greenburg,* and *E. H. Reeves.* U. S. Pub. Health Ser., Pub. Health Rep., March 5, 1920, 35, No. 10, 518–534. — In most industrial plants the protection of the worker against the hazard of industrial dusts is effected by reducing the dust content of the air to a reasonable level, by the use of exhaust hoods and suction fans, by carrying on dust-producing operations in enclosed spaces, or by substituting wet processes for dry grinding. In other industrial processes it is impossible to render the air sufficiently free from dust to avoid danger. In such cases, protection can be attained only by the use of helmets, masks, or respirators; but the discomfort to the person wearing them renders them, for the most part, impractical.

Studies made upon different forms of respirators by Kobrak and Schablowski are recorded in Volume 68 of the Zeitschrift für Hygiene for 1911. The same subject is also dealt with in the General Report of the Miners' Phthisis Prevention Committee of South Africa, issued in 1916 (pp. 28–30).

The authors herewith present the results of their investigation of the problems that arose in the sand-blasting department of a large automobile factory in Connecticut. Tables, diagrams and conclusions are included. — L. A. Shaw.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

OCCUPATION IN RELATION TO TUBERCULOSIS. *George M. Kober.* U. S. Pub. Health Ser., Pub. Health Rep., March 26, 1920, 35, No. 13, 751–759. — As a result of numerous independent investigations it is known today that persons habitually engaged in hard work, especially in factories and indoors, present a greater amount of sickness and a higher mortality than persons more favorably situated, and that the character of the occupation influences to a great extent not only the average expectation of life but also the prevalence of certain diseases.

In addition to the germ which is the approximate cause of infection, in the case of tuberculosis there must also be a suitable soil for the development of pathogenic effects. Such soil is usually found in persons of feeble physique. A vulnerability of the tissues may also be acquired by indoor life and dusty occupations, especially when the work involves exposure to dampness, extremes of heat and cold, sudden changes of temperature, and exposure to industrial poisons. The author is not disposed to overrate the dangers of indoor life and occupations, but he feels that if the necessary precautions are neglected there is every reason to assume that the habitual inhalation of vitiated air plays an important rôle in the causation of respiratory diseases. Inadequate floor space is found to be the cause of very frequent contact infections, as a result of which there is noted an undue prevalence of consumption, pneumonia, and septic sore throat.

Other bad effects in many indoor occupations result because the work is often performed by the worker while in a stooped position. All thoracic postural deformities naturally interfere with free expansion of the lungs and hence with the respiratory functions.

Owing to the numerous safeguards which

nature has provided to prevent the lodgment of dust in the lungs and in the trachea, only a small amount of dust actually reaches the lungs; but when, as a result of long continued exposure, this protective influence is diminished or ceases, dust will reach the air vesicles and produce mischief.

The author discusses the pathological effect of the different kinds of dust: municipal dust, general organic dust, vegetable fiber dust, animal and mixed fiber dust, mineral dust, and metallic dust. He is convinced that exposure to dust alone does not account for the undue prevalence of tuberculosis in certain occupations, and that every factor which undermines the general health of the individual is at least of equal if not greater importance in determining the course of the disease. Tables are arranged in such a manner as to show the percentage distribution of pulmonary tuberculosis in certain occupations in an ascending scale and according to exposure to the different varieties of dust. Comments are offered as to possible influence of physique, standards of living, and the effects of alcohol, lead, mercury, and other industrial poisons. — L. A. Shaw.

Railroads to Fight Venereal Disease. Soc. Hyg. Bull., Feb., 1920, 7, No. 2, 6. — At a joint conference in Atlantic City, January 8, of the officials of the U. S. Public Health Service, United States Railroad Administration and the American Social Hygiene Association, plans were put under way for extending the nation-wide antivenereal disease campaign to the several million employees of the railroads throughout the country. It was demonstrated that there was a definite relationship between venereal diseases and impaired efficiency, accidents and casualty costs. Several of the surgeons cited examples to show that men in the early and advanced stages of paresis were frequently found to be in charge of trains or in other responsible positions endangering the lives of the public and the property of the companies. The close relationship of venereal diseases and "unsafe practices" as understood by the Safety Section officials was asserted. — L. A. Shaw.

Syphilis. Med. Times (London), March, 1920. — This issue devotes much space to the various aspects of venereal disease, which, according to an editorial note, is a problem that must be faced. It is undermining the nation's health and is responsible for many cases of insanity, nervous diseases, blindness, etc. Dr. Mary D. Scharlieb deals with its effects on infants and children. J. E. R. McDonagh, in *Some Reflections on the Treatment of Syphilis*, says there is no such thing as a standardized treatment, and points out that as each patient's resistance is largely influenced by his mental attitude, the occasion often arises when the doctor can do more by suggestion than by drugs. He gives the following suggestions to be kept foremost in the mind of everyone who has a case under treatment: (1) Study the psychology of the patient; (2) diagnose clinically the type of disease; (3) prescribe intramine and colloidal iodine in the maximum course of arseno-benzene and mercury to increase the action of the metals and to prevent metallic intoxication and nervous manifestations; (4) in early cases supplement the maximum course with mercury, intramine and colloidal iodine prescribed intermittently for one or two years; (5) treat late cases symptomatically; (6) place no reliance on the Wassermann reaction as a guide to treatment or as a test of cure.

Dr. Thomas Dutton, in *Syphilis: Its Eradication and Treatment*, says, "This disease ought to have been stamped out years ago. Any amount of money spent in ridding the nation of this 'white plague' would be money well-spent and returnable four-fold by the extra health and work of all classes. Had scientific men, instead of commercial magnates, been at the head of the Government, it would have been, and what is more important, it would have been made an international question so that all European States would devise laws to prevent a person in a contagious stage of syphilis from going from one country to another and so spreading the disease." The writer goes on to criticize the "feeble attempt to grapple with the complaint" made by the government and lays down certain laws which should govern the treatment of cases. "In brief," he says, "the eradication of syphilis can be accomplished by (a) an international agreement, (b) payment of fees by the State, (c) perfect secrecy, (d) free choice of a duly qualified surgeon where consultations are in private, and (e) entirely ignoring the moral phase of the disease." He is dubious about the value of too much publicity, but thinks that something may be done by guardians or teachers.

Another equally outspoken article is by H. Wansey Bayly, under the apt title of *The*

Pharisaical Ostrich. He points out that leprosy, smallpox, typhus, yellow fever and malaria have been practically wiped out, or at least greatly reduced, while venereal disease has increased to the extent of being a racial menace. "This curious exception in the downward curve of infectious diseases is due to the fact that these diseases are preserved and protected . . . by an impenetrable zone of inky blackness. This protective surrounding fog is composed of a combination of ignorance, cant and humbug." "If venereal disease was frankly treated," he goes on to say, "in the same way as other much less deadly diseases are treated, by disinfection after exposure to risk, notification, segregation and enforced treatment, and stripped of its mantle of mystery, syphilis could almost certainly be exterminated in a generation." He criticizes severely the attitude of the London County Council who turned down the suggestion of the National Society for Combating Venereal Disease for the provision of early treatment centers. He looks with hope to the fact that women now have a vote, and is strongly in favor of immediate self-disinfection, which is anathema to many people and to many public bodies who dread making vice safe and consider fear of infection a useful deterrent.

The issue also contains useful summaries of memoranda issued by the Ministry of Health, the Medical Women's Federation, etc., together with abstracts of articles appearing in other British and American journals, and reviews of books dealing with this subject. Though none of the writers in this number deals with syphilis strictly from an industrial point of view, no excuse should be necessary for drawing attention to it in these pages. — A. F. Kent.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

The Detection and Treatment of Some Trade Eruptions. *R. Prosser White.* Med. Times (London), 48, No. 2113.—The writer remarks that the subject of trade rashes is often regarded as a special branch of dermatology and is thus relegated to so late a stage in the student's curriculum that he rarely masters it. The young practitioner seldom starts with a clear idea of eczema, seborrhea or impetigo. These diseases are readily altered, almost out of recognition, by the growth of secondary infections, chiefly staphylococcus and streptococcus, and the usual non-committal diagnosis of eczema is risked. Owing to recent legislation, occupational diseases of the skin have come into greater importance. Some of them fall under the head of trade accidents for which the patient can claim compensation.

The first question to be asked in examining a skin complaint is, Is it due to a toxin or organism circulating in the blood stream or is it caused by external irritation? Often there is a combination of these agencies. A fundamental difference between a professional and an idiopathic skin disease is that in the former the irritant acts from outside, and in the latter it circulates in the capillaries or the lymphatics. The writer holds that in a trade dermatosis the primary lesions begin as a folliculitis and from these apertures the inflammation spreads to the contiguous parts. Petroleum oil, tar, pitch, and soot, being slow acting agents, retain this distribution a long time and resemble an acneform eruption. Other trade agents and chemicals, such as lime, chrome, arsenic, and disulphides of sodium, at their commencement favor the same situation. Compare also the numberless dermatites caused by T.N.T., tetryl, and other explosive powders. With many of these agents the inflammatory reaction speedily spreads between the follicles. Such cases develop sheets of erythema or fine papules or vesicles, and are confused with eczema. The deeper red puncta of the open or even pouting mouths of the open stomata may be missed. The action of other strong chemicals is so intense that they corrode or burn the tissues, producing sores and ulcers. Constant maceration in the mildest alkaline solutions dissolves the horny layer of the skin which is its chief protection. In order of frequency, trade rashes are caused by the alkalies, lime, chrome, the coal and petroleum products, sulphide of sodium and arsenic.

A few chemicals irritate other parts of the cutaneous surface than those which are uncovered. Fine dusts are apt to fall inside the collar or under the cuffs. Certain drugs, such as phenylhydrazin, paraphenylendiamin and the toxins of certain plants, may precipitate rashes on the skin at a distance from the parts actually in contact. The writer gives some

valuable hints as to the diagnosis of trade eruptions and gives prescriptions for a paint, lotion and ointment, which he has successfully used. — A. F. Kent.

A Lecture on Miners' Nystagmus. *T. Lister Llewellyn.* Tr. Institution Mining Engineers, Feb., 1920, 58, Part 3, 167–182. — This article gives the history of miners' nystagmus, its symptoms, frequency, and cost. The liability to accident of men suffering from nystagmus, the factors determining the occurrence of the disease, such as age, occupation and method of work, the influence of seams, illumination, and the personal factors, and the prevention of nystagmus are discussed. — G. M. Fair.

Miners' Nystagmus. *J. Court.* Med. Times (London), 48, No. 2113. — A brief contribution to a subject which is attracting a great deal of attention in Great Britain at the moment. The opinion of experts is that the deficient light given by the safety lamp is the chief cause of miners' nystagmus. Miners suffering from myopia, hypermetropia, or astigmatism are more liable to contract the disease than are those with ordinary vision. A high percentage of cases have been found to show errors of refraction, in common with a large proportion of adult working men and schoolchildren, but these men seldom develop nystagmus when working in naked-light pits. The condition of lighting in all mines, says the writer, should be made equal to, or better than that where naked lights are used. There is also a personal factor and it is remarkable that so many young men have the complaint. Many bad cases suffer also from photophobia and night-blindness. Owing to the great improvement in lighting in all British collieries, however, bad cases are not nearly so common as formerly. Exhaustion and fatigue have a bad effect on some cases. When insanity is inherited, nystagmus may possibly be an exciting cause since many cases suffer from great depression of mind. Nystagmus should be looked on as a neurosis, and any means for the avoidance of eye-strain should be adopted. The writer discusses some improvements which might be made in the lamps, e. g., the use of amber-colored glass. — A. F. Kent.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

Some Outstanding Facts in the Safety Movement. *C. W. Price.* Am. Labor Legis. Rev., March, 1920, 10, No. 1, 25–26. — "Accident prevention has offered the first legitimate common ground on which employer and employee can meet with mutual interest and understanding and with profit to both." The writer points out that the experience of thousands of industrial plants in which accidents have been reduced from 50 to 75 per cent. shows that not more than one-third of this accident prevention was possible by the development of mechanical guards or equipment. The rest was accomplished through effective organization and the development of safety education.

Among the important factors in arousing interest in safety have been state compensation laws. They have tended to define causes of accidents, and have placed the responsibility for accidents with employers. In spite of the rapid strides which have been made in accident prevention during the last ten years, it is pointed out that not more than 10 per cent. of the industrial plants at present have effectively developed educational work in safety. The ultimate success of the safety movement will not depend entirely upon the advances made in industry. It will be necessary for the safety idea to be carried into the community so that it becomes an integral part of the community life. Schools, public officials, clubs, churches, and civic organizations should all play their part in accident prevention. — C. H. Paull.

Prevention of Accidents by the Statistical Method. *Royal Meeker.* U. S. Bur. Labor Statis., Month. Labor Rev., March, 1920, 10, No. 3, 1–3. — Analysis of accident statistics is invaluable in detecting the cause of accidents, and especially in placing the responsibility for the more severe accidents, though in no case can responsibility be accurately placed. There must be the fullest co-operation between management and men if accidents are to be reduced to the irreducible minimum. Information regarding accident occurrence and results collected in a uniform manner from all industries and plants throughout the country and tabulated in a uniform

manner would enable the safety movement to be directed intelligently toward the reduction or elimination of the more severe accidents in the industries and occupations with the higher severity rates. — L. A. Shaw.

NON-ENGLISH-SPEAKING ACCIDENT FREQUENCY. *E. E. Bohner.* Safety Engin., March, 1920, 39, No. 3, 111. — A large part of the accidents in industry are traceable to a lack of knowledge of the English language. Not only is the accident rate higher among non-English-speaking employees, but there is not the same tendency to improve that is noted among English-speaking employees. The accident frequency rate among the non-English-speaking workers in a large steel concern, covering an eight-year period, was 2.3 times that among the American born. — R. Thomson.

CARELESSNESS, AWKWARDNESS, IGNORANCE, STUPIDITY STILL A MENACE. *George W. Bowie.* Safety Engin., Feb., 1920, 39, No. 2, 73–76. — Eternal diligence and vigilance are absolute necessities in our workaday lives. The evil of losing time through injury is becoming comparable with turnover and absenteeism, and can be reduced according to the extent and activity with which we combat the hazards of carelessness, awkwardness, ignorance, and possible stupidity of those who get injured, probably because the dangers and hazards which are incidental to their employment have not been fully explained to them. By proper instructions, the foreman can put the men he hires on their guard to protect themselves. — R. Thomson.

PROTECT WORKMEN BY INCLOSING SWITCHES. *W. A. Waldschmidt.* Electrical World, March 27, 1920, 75, No. 13, 729–731. — Records show that exposed switches have been responsible for many accidents. The features of typical inclosed switches are discussed, together with the rules regulating the use of switches formulated by various private and governmental agencies. — G. M. Fair.

GROUNDING AND POLARIZATION AS PROTECTING MEASURES. Part II. *W. J. Canada.* Electrical Rev. (Chicago), March 6, 1920, 76, No. 10, 391–394. — A discussion of how certain electrical circuits should be grounded to afford protection against fire and life hazard. — G. M. Fair.

NOTES ON AN EXPLOSION OF COAL-DUST AT PENNANT HILL COLLIERY, NEAR DUDLEY, WORCESTERSHIRE. *J. R. Felton.* Tr. Institution Mining Engineers, Jan., 1920, 58, Part 2, 111–117. — A description of the circumstances attending the explosion at the above-mentioned colliery. — G. M. Fair.

THE SAFETY LAMP AND ITS USE IN CHEMICAL INDUSTRY. *W. Payman.* Jour. Soc. Chem. Indust., Feb. 28, 1920, 39, No. 4, 67–68R. — "The obvious precautions to be taken in order to prevent both explosions and fires wherever inflammable liquids are used are: (1) the use of some form of safety lamp where artificial illumination is required, and (2) the enforcing of rules similar to those usual in coal mines or explosives factories to prevent the introduction of any form of naked light." Such regulations should apply wherever a large surface of inflammable liquid may be exposed to the air, for example, in the preparation of dopes and varnishes, wherever inflammable products like rubber solutions are prepared or used in quantity, and wherever leakage may occur from plant or containers.

The author outlines the special claims made for the two kinds of safety lamps in use in the British Isles — flame lamps and electric lamps — and gives a general idea of the safety tests to which they must be subjected before they are approved by the Home Office. Although lamps are at present constructed to satisfy the special requirements of the coal miner, modifications will at once suggest themselves for lamps to be used in chemical works to increase their lighting efficiency without in any way interfering with their safety. — M. C. Shorley.

ACCIDENTS ON STEAM RAILROADS IN THE UNITED STATES IN 1918. U. S. Bur. Labor Statis., Month. Labor Rev., March, 1920, 10, No. 3, 159–160. — Statistics of accidents on steam railroads in the United States in 1918 are presented by the Interstate Commerce Commission in its Accident Bulletin No. 70, recently issued. Accidents are reported in three groups: train accidents, train-service accidents, and non-train accidents. A table furnishing casualty statistics is appended. — L. A. Shaw.

INDUSTRIAL SURGERY

SUTURE OF WAR WOUNDS. *Drury Hinton.* Ann. Surg., Feb., 1920, 71, No. 2, 191–199. — An outline of the organization, types of cases, and technique used by the author in treating cases suitable for primary or delayed primary suture of war wounds. The results of this régime are given in the accompanying tables. — C. C. Lund.

ON THE RESULTS OF BRIDGING GAPS IN INJURED NERVE TRUNKS BY AUTOGENOUS FASCIAL TUBULIZATION AND AUTOGENOUS NERVE GRAFTS. *Harry Platt.* Brit. Jour. Surg., Jan., 1920, 7, No. 27, 384–389. — The author concludes from the results of a series of eighteen operations, in which nerve grafts combined with fascial tubulization, and tubulization alone were used, that there was complete absence of any clinical sign of recovery. All of the cases had to have the bridged section excised later and the freshened ends directly sutured. — C. C. Lund.

QUEEN'S HOSPITAL FOR FACIAL AND JAW INJURIES, FROGNAL, SIDCUP, KENT, ENGLAND. *L. W. Johnson.* U. S. Nav. Med. Bull., Jan., 1920, 14, No. 1, 17–65. — This article describes the hospital and some of the ingenious methods used by its surgeons in the treatment of very distressing deformities. The technique of the use of the tubed flap in plastic surgery, the repair of eyelids and eye-sockets, rhinoplasty, and the repair of bone injuries are among the other subjects included. — C. C. Lund.

WOMEN AND CHILDREN IN INDUSTRY

THE RELATION OF HEAVY LIFTING TO THE HEALTH AND OUTPUT OF WOMEN. Bull. N. Y. State Ind. Com., Jan., 1920, 5, No. 4, 77. — No fair and satisfactory standards have been fixed either in this country or abroad on the question of lifting for women. In the report of the Health of Munition Workers Committee in England, it is shown that strain produces specific physical injuries and that output is decreased through the following causes: (a) irregular attendance at work; (b) dropping out of workers after they have been trained; and (c) fatigue great enough to limit output but not to force the worker from her machine. In this country New York State has taken the initiative to limit the weight to be lifted by women.

In the final analysis, however, it is concluded by employers both in this country and abroad that the matter of lifting heavy weights and of heavy work for women comes down to personal equation. Before a woman is permitted to do heavy work, she should be given a physical examination and her capacity determined by medical authority. — L. A. Shaw.

PROTECTION OF MATERNITY AN URGENT NEED. *Irene Osgood Andrews.* Am. Labor Legis. Rev., March, 1920, 10, No. 1, 47–50. — "Motherhood is now one of the most hazardous occupations open to women, according to the announcement of the federal Children's Bureau." In view of the foregoing statement the writer points out some of the important features of the maternity provisions in the Draft Convention of the First International Labor Conference. The conference recommended that a rest period of six weeks be provided after birth of children before women are allowed to return to work, and that they be given the right to leave work six weeks before childbirth. During absence from work the mother should be paid sufficient benefits to provide for the healthy maintenance of herself and child, and should be furnished free medical attendance. Special provisions are also made for the care of women who are forced to remain away for a longer time than that specified.

Provisions similar to those introduced into the Draft Convention have already become laws in many countries. Twenty-three countries at least and five states have provided rest periods both before and after childbirth. In thirteen countries maternity benefits are provided. New York, Massachusetts, Connecticut, Missouri, and Vermont forbid the employment of women for certain periods varying from two to four weeks before and after childbirth, but none of these states makes any provision for either cash benefits or medical service.

The importance of benefits and medical service is obvious not only in the case of the mother, but also in the case of the child. Since increase in the size of family brings with it no increase in income, additional expense for food and other service is apt to be impossible. — C. H. Paull.

International Congress of Working Women. Am. Child, Nov., 1919, 1, No. 3, 193–195. — At a meeting of the International Congress of Working Women held in Washington on October 28, 1919, it was resolved to register with the International Labor Conference of the League of Nations, in which women have no direct vote, demands on behalf of children gainfully employed. These demands are of interest in that they represent the views of the women of twelve nations. — L. A. Shaw.

New York State Conference on Child Welfare. Am. Child, Nov., 1919, 1, No. 3, 196–199. — At a conference on child welfare held in Albany, October 16, 1919, under the auspices of the state departments of labor, education and health, the following subjects were discussed: child labor laws and compulsory attendance laws; raising the minimum age at which children may leave school and enter industry; changes in the school system; and the establishment of continuation schools. — L. A. Shaw.

The Employment of School Children. *A. P. Gould.* The Child, March, 1920, 10, No. 6, 241–245. — Great hopes have been aroused by the new education bill, but the measure has been weakened by provision for local by-laws, especially governing the use of hours before school in the morning. It is highly important to eliminate such morning work. Too early rising has been declared by physicians to be detrimental to the health of many children who are employed in occupations demanding it. — G. E. Partridge.

The Provision for Occupation of Children out of School Hours. *H. R. Burpitt.* The Child, March, 1920, 10, No. 6, 246–249. — The hours that children work in the aggregate would be incredible to those who do not know the facts. One case is reported of a boy who worked eighty-three hours each week, including his school work. By-laws are coming in all over the country (England) limiting employment of children. The writer believes that the play centers are an important adjunct to laws in improving the condition of children, and he meets the objection that these public play centers take the child away from the home too much. — G. E. Partridge.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

Code Governing Industrial Lighting in Places of Employment Including Factories, Mills, Offices and Other Work Places. Bureau of Labor, State of Oregon, 1919. — It has been shown by careful investigation in recent years that not less than 20 per cent. of preventable accidents are due either directly or indirectly to improper illumination. The 1919 legislature of the state of Oregon undertook, therefore, an important step towards the prevention of unnecessary accidents by providing for general and emergency lighting, both natural and artificial, in all places of employment. As a result, the Oregon Bureau of Labor has issued the above-mentioned pamphlet of seventy pages — a pamphlet containing the industrial lighting code adopted by Oregon together with explanations of the various provisions of the code, diagrams, photographs, and an industrial classification showing the minimum required values of lighting as directed in the code, with preferable values for a large class of work. — K. R. Drinker.

Inadequate Factory Lighting. *Thomas F. Chantler.* Safety Engin., Feb., 1920, 39, No. 2, 66–73. — The most complete table of lighting intensities yet published is that embodied in the tentative lighting code announced by the Industrial Commission of Ohio, a copy of which is included in this article. — R. Thomson.

On Ventilation. *J. J. R. MacLeod.* Pub. Health Jour., March, 1920, 11, No. 3, 101–118. — This article represents a scientific consideration of the principles of ventilation,

dealing with bodily comfort and its relation to the physical conditions of the environment; the causes of imperfect ventilation and its effect upon the physiological organism; the effects of temperature and the vitiation of the atmosphere; ventilation in its relation to infection; ideal systems of heating, ventilating, etc. — L. A. Shaw.

Science and Art of Heating — II. *T. N. Thomson.* Plumbers' Trade Jour., April 1, 1920, 68, No. 7, 494–499. — A discussion of the one-pipe steam heating system and the restrictions of its usefulness. — G. M. Fair.

Decay of Factory Roofs Checked by Proper Heating. Engin. N.-Rec., March 18, 1920, 83, No. 12, 578–579. — Artificial humidity and ineffective arrangement of heater pipes are conducive to rapid decay of wooden roofs. Methods of preventing the destruction of factory roofs are outlined. — G. M. Fair.

Drinking Water Facilities in Industrial Plants. *J. A. Watkins.* Safety Engin., Feb., 1920, 39, No. 2, 54–60. — The author discusses the general principles upon which the installation of drinking facilities for industrial plants should be based, and gives the following as the basic requirements of all drinking water systems:

1. The purity of the supply should be unquestionable.
2. The quantity supplied should amply meet the physiological needs of the workers.
3. The water should be palatable, i. e., free from disagreeable odor, color or taste.
4. The supply should be so distributed as to (a) insure proper temperature of the water at the time of consumption; (b) be conveniently accessible at all times to the personnel of the establishment; and (c) preclude the transmission of disease from one person to another. — R. Thomson.

Guiding Principles in Water Purification Plant Operation. *W. H. Dittoe.* Munic. Eng., March, 1920, 58, No. 3, 130. — A description of the care and supervision which water purification plants should receive. — G. M. Fair.

Water for Shipyard Drinking Fountains Treated by Violet Rays. *Walter L. Decker.* Engin. N.-Rec., March 18, 1920, 84, No. 12, 572–573. — A description of the purification by filtration and ultra-violet light disinfection of an industrial water supply, together with the results obtained as shown by bacterial analyses. A fuller discussion of the plant is found in Chemical and Metallurgical Engineering, Vol. 22, page 639. — G. M. Fair.

The Sterilization of Water by Means of Ultra-Violet Rays. *Walter L. Decker.* Chem. and Metall. Engin., April 7, 1920, 22, No. 14, 639–645. — A discussion of water disinfection by means of ultra-violet light with especial reference to its use in an industrial installation at Wyandotte, Michigan. — G. M. Fair.

Science and Art of Plumbing — II. *T. N. Thomson.* Plumbers' Trade Jour., April 1, 1920, 68, No. 7, 485–488. — This article deals with plumbing fixtures, old and new, and their kinds and classes. — G. M. Fair.

Rules for the Operation of Sewage Treatment Plants. *H. R. Abbott.* Munic. Eng., March, 1920, 58, No. 3, 134–135. — An outline of regulations governing the operation of all types of sewage disposal works. — G. M. Fair.

New Institutional Sewage Treatment Plant. *George L. Robinson.* Munic. Engin., April, 1920, 58, No. 4, 150. — A description of a small sewage treatment plant incorporating some novel ideas which may be of value to the designer of plants of limited capacity. — G. M. Fair.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

Keeping Tab on Sickness in the Plant. *Dean K. Brundage* and *Bernard J. Newman.* U. S. Pub. Health Ser., Pub. Health Rep., April 9, 1920, 35, No. 15, 881–890. — General measures are less effective in accident prevention than are specific measures dealing with the conditions which are peculiar to each factory and to each particular occupation within the

factory. Notwithstanding the large sums of money which have been spent for sanitary improvements, the collection of information to ascertain the causes of and to locate the responsibility for the sickness occurring has been completely ignored.

The prevention of disease among industrial workers can be accomplished with scientific accuracy only by a properly administered system of morbidity statistics. The U. S. Public Health Service hopes to aid in the task of keeping tab on sickness in industrial establishments (a) by assisting plants in keeping and interpreting sickness records for their own use, and (b) in rendering the experience of these plants available for each other, as well as for any plant or individual interested in the prevention of sickness among wage-earners. — L. A. Shaw.

WHY A FACTORY DOCTOR'S SALARY COSTS LESS THAN NOTHING. *G. L. Howe.* Factory, March 1, 1920, 24, No. 4, 618–621. — The writer attempts to develop from data collected from different sources a tabulation of the major savings to an industry employing 1000 workers as a result of maintaining a medical department. Chief among the savings are:

1. Reduction of time lost through sickness with an estimated return to the company of $683.

2. Increase of output due to improved health of workers. The return to the company in this case would have to be worked out for each individual case.

3. Net saving to company by the elimination of infections — $2442.

4. Reduction of compensation payments — $1105.

The total of these major savings amounts to $4230. Besides these there are a great number of less tangible returns from medical service, so that the writer estimates that even if the medical department should cost from $5000 to $10,000 per year it would more than pay for itself. He calls attention to data, however, which tend to show that the average cost of medical service per 1000 employees is only $2210 per year or $2.21 per employee. — C. H. Paull.

HOSPITAL WORK IN A LARGE MACHINE-TOOL PLANT. *Sanford DeHart.* Am. Machinist, March 25, 1920, 52, 13, 658–660. — This article describes the means used to protect employees from sickness and accidents in the machine-tool plant of the R. K. LeBlond Co., Cincinnati, Ohio. The writer discusses cause of accidents, classification of injuries, and the scope of industrial hospitals. — G. M. Fair.

INDUSTRIAL NURSING

THE NURSE IN INDUSTRY. Nat. Organization for Pub. Health Nursing. — This folder is published by the National Organization for Public Health Nursing for the purpose of giving the public a clear and concise idea of just what the functions of an industrial nurse are, what her special qualifications should be, and how valuable her services are to industrial organizations. Particularly important are the paragraphs entitled, *Does It Pay to Employ an Industrial Nurse? How Do Insurance Companies Value a First Aid Room with an Industrial Nurse?* and *How May an Industrial Nurse Be Obtained?* All persons interested may obtain copies of this folder from the main office of the National Organization for Public Health Nursing, 156 Fifth Ave., New York City. — M. C. Shorley.

A COURSE IN NURSING SERVICE IN INDUSTRY. U. S. Pub. Health Ser., Pub. Health Rep., Feb. 6, 1920, 35, No. 6, 282. — Announcement is made that the New York University, School of Commerce, Accounts, and Finance, is offering a course especially arranged for industrial nurses, welfare workers, and those who contemplate entering the field of industrial welfare work. In the lectures and discussions special consideration will be given to such topics as the following: (1) duties and responsibilities of the nurse in small and large industries; (2) methods of teaching the worker and his family how to keep well; (3) most approved methods required for follow-up health service in the plant; (4) relation of the nurse to the industrial community; (5) home nursing and personal hygiene; (6) reducing labor turnover through health measures; and (7) amount of hospital care available for the worker. — L. A. Shaw.

INDUSTRIAL PERSONAL AND COMMUNITY HYGIENE: HOUSING, ETC.

BETTER HOUSES FOR WORKERS. *H. E. Miles.* Am. Industries, April, 1920, 20, No. 9, 26–31. — In reviewing a number of recent housing projects in this country, the writer calls attention to the importance of looking upon housing as a problem to be dealt with in a strictly scientific manner. "Every project must be laid out at the start as an entirety with every house designed for utility, for its own beauty and for its enhancement of the beauty of all others." Although the desirability of building houses for sale is uppermost in the minds of most people, it is highly important that some houses be provided upon a rental basis for the younger married workers who do not find themselves ready to begin the purchase of a house.

In summing up financial provisions and safeguards which should be included in a scheme for housing workers, attention is called to the following points:

1. "Build lasting structures with a view to loaning from twenty to sixty years on buildings and eighty on land.

2. "Keep the cost as low as consistent with quality. . . .

3. "Sell at approximately cost and on terms which wage earners of varying incomes can meet without anxiety or failure. . . .

4. "Form local housing corporations, with the aid of local chambers of commerce. Let manufacturers, merchants, and professional men buy the stock, and let this stock be limited to a dividend of six per cent.

5. "Ultimately — and why not now? — preserve the unearned increment in the housing corporation, as other nations do." — C. H. Paull.

HOUSING. Housing Betterment, Dec., 1919, 8, No. 4. — Contains many brief articles dealing with a variety of phases of the housing problem. There is a review of the Garden City experiment, "the only modern instance of the planning of a town as a whole," in which the essential features are the provision of an agricultural belt and the limiting of houses to twelve to an acre. The English after-the-war housing plans are described, particularly the provision for the erection of 29,000 new dwellings in London, and the project for the early clearance of the worst remaining insanitary areas of the city, now containing a population estimated at 40,000. The proposed model suburb in Quebec is described, and the housing situation in France, where building is practically at a standstill on account of high costs. The "hotel club" is proposed as the right way to house the single worker. A report of the results of a questionnaire addressed to workingmen and calling for data and expression of preferences in regard to housing contains some suggestions of value. The six-room house is in greatest demand, and the workingman is willing to pay for such conveniences as electric lighting, bath-tubs, and wash-tubs. Municipal housing as proposed in Pennsylvania, standardized fabricated houses, the housing of business women, the need of a million homes in the United States, the housing situation in several cities, general factors in house shortage are among the topics touched upon. — G. E. Partridge.

THE INCOME TAX VERSUS THE HOUSING SHORTAGE. *Walter Stubler.* Nat. Munic. Rev., April, 1920, 9, No. 4, 204–206. — The writer, who has had broad experience in the handling of mortgage money in his connection with the Metropolitan Life Insurance Company, points out that one of the chief causes for lack of housing facilities at the present time is the difficulty which builders experience in obtaining mortgage money. Although there is plenty of money in the country, it is being invested in other ways. The reason for this is obviously that mortgages no longer pay as well as other investments. This is due in an important measure to the fact that the income tax reduces the income of large individual lenders of mortgage money so low that tax-free investments have become much more attractive.

In order again to induce money to flow into channels that will result in an increase in building activities, it is recommended that for a period of years returns from real estate loans up to a certain amount be exempt from income taxes. This would be a post-war emergency measure which would bring the relation between demand and supply in the housing field back to normal. — C. H. Paull.

HOUSING AND TOWN PLANNING. *James White.* Canad. Engineer, April 1, 1920, 38, No. 14, 347. — A report on the activities of the Canadian Commission of Conservation. — G. M. Fair.

INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS: SPECIAL TESTS IN THE SELECTION OF EMPLOYEES

PLANNING A PERSONNEL DEPARTMENT. *M. R. Lott.* Factory, March 1, 1920, 24, No. 4, 614–617. — The purpose of this article is to outline a possible organization for a personnel department in a plant employing 3000 workers and in one employing 1000 workers, and to indicate the duties falling to the different sub-departments and to the officers in charge of these departments. In a plant employing 3000 workers, the writer suggests grouping the activities of a personnel department under four heads: (1) employment; (2) factory conditions (safety and care of workers); (3) hospital; (4) mutual interest. In the smaller plant the work would be grouped under the direction of two officers, namely, the employment supervisor and the safety engineer. Organization charts are given for both of these plans.

The duties assigned to the hospital section in the personnel organization in the larger plant are:

1. Making physical examinations, including follow-up.
2. Providing first aid.
3. Rendering treatment in minor ailments.
4. Co-operating with the safety engineer in handling compensation cases.
5. Supervising factory hygiene.
6. Supervising educational work in hygiene for employees.
7. Maintaining records. — C. H. Paull.

MENTAL TESTS IN PRACTICE. *A. G. Morphy.* Canad. Jour. Ment. Hyg., Jan., 1920, 1, No. 4, 336–341. — A critical discussion of the Binet-Simon intelligence tests and their practical applications. It is on the emotional and moral side that the tests are lacking. It must be borne in mind that any measuring scale is in fact merely a convention adopted for practical purposes and should only be used in connection with a complete study of each case, including all obtainable data — medical, educational, and social. — S. Cobb.

MEASURING INTELLIGENCE. Journal of Heredity, Feb., 1920, 11, No. 2, 86–87. — The article contains a chart showing the measured intelligence of 36,500 men classified according to occupation. Engineer officers stand at the head of the list, followed by army chaplains, medical officers, Y. M. C. A. secretaries, and civil engineers. At the end come barbers, hostlers, concrete workers, farmers, mine drill runners, teamsters, general miners, tailors, and finally — lowest of all — laborers. The data have been reproduced from *Army Mental Tests.* — G. E. Partridge.

TESTS OF DISCRIMINATION AND MULTIPLE CHOICE FOR VOCATIONAL DIAGNOSIS. *D. Sunne.* Psychological Bull., Aug., 1919, 16, No. 8, 262–267. — The Yerkes multiple choice apparatus and the McComas discrimination apparatus used in testing disabled soldiers for vocational diagnosis were used and the results show correlations between these tests and the Alpha tests of the army. The author believes these tests indicate some of the predominant characteristics of the subjects. Disabled men were also subjected to several tests of motor ability and the results of the experiments as a whole have proved to be of considerable assistance in selecting proper vocational courses for the men. — G. E. Partridge.

THE PURPOSES AND METHODS OF PSYCHOLOGICAL TESTS IN SCHOOLS AND COLLEGES. *S. S. Colvin.* Education, March, 1920, 40, No. 7, 404–416. — In planning tests by which to measure general intelligence, we must be extremely careful to base the materials of the tests on the common experience of the group tested. For this reason there can be no general test for general intelligence. Psychological tests are valuable aids in forming estimates of ability, but they must not be followed blindly, and they should rarely be accepted as final without additional evidence of their validity obtained from all possible sources. — G. E. Partridge.

CONDENSED GUIDE TO THE BINET TESTS. *S. D. Porteus* and *H. F. Hill.* Training School Bull., March and April, 1920, 17, Nos. 1 and 2, 1–39. — The Binet tests and the test procedure are here given in a concise and useful form, together with an historical summary and criticism of the methods. The proof of the validity of the Binet tests for diagnostic purposes has been mainly based on mass results,

and the agreement with experience in a very large number of cases has sometimes been taken as sufficient proof of universal validity. This is unjustified. Diagnosis is an individual matter and correct diagnosis is just as important in the case in which intellectual capacity is not the main factor in social fitness as it is in the case in which a Binet age test does give a fair indication of social efficiency. — G. E. Partridge.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

Pennsylvania Health Legislation of 1919. Pennsylvania Health Bulletin No. 103, Jan., 1920, pp. 39. — Such legislative acts of 1919 as directly affect the department of health are herein reproduced. — L. A. Shaw.

Employer's Responsibility for Occupational Diseases in France. Safety Engin., March, 1920, 39, No. 3, 142. — A schedule relating to lead and its compounds and to mercurial poisoning, included in the accident insurance law of France by the amendment of October 25, 1919. — R. Thomson.

American Experience with Workmen's Compensation. *Willard C. Fisher.* Am. Econ. Rev., March, 1920, 10, No. 1, 18–47. — It is less than nine years since the first of the really effective workmen's compensation laws was enacted in this country, and yet at the present time forty-two of the forty-eight states have compensation laws. In the ten years during which the compensation idea has had its rise, it has constantly gained friends. Although the provisions of early laws with regard to type of workers involved, waiting period, provision for medical care, etc., have been broadened from time to time, employers are hearty supporters of compensation. Insurance companies look upon it with favor. Labor, although apt to be hostile at first, is coming more and more to appreciate its desirable features.

To emphasize the social importance of compensation laws, attention is called to the amount paid in compensation in various states. In Wisconsin cash benefits between 1911 and 1918 amounted to $5,144,000. California awards amounted to $13,370,000 between January 1, 1914 and December 31, 1917. If the experience of Pennsylvania and New York were taken as a criterion for the entire country, an annual compensation payment of $200,000,000 would be made. Although this amount seems large, it would not bring a very considerable sum to individual workers or to their families. In Pennsylvania the average award for fatal injury in the years 1916, 1917, and 1918 was $2,383, $2,272, and $2,659 respectively. Small as these sums appear, they are much more satisfactory on the whole than the precarious damage payments obtained by the old method of litigation.

Undoubtedly, compensation laws with the resulting systems of compensation insurance have had something to do with the development of accident prevention work. The extent of this relationship cannot be definitely determined. Perhaps too much emphasis has been placed upon it at times. Accident prevention work was well under way in certain industries before the introduction of compensation laws. Undoubtedly, a variety of influences have been at work in bringing the safety movement to its present status.

Among the anticipated and the actual consequences of compensation laws are:

1. Promotion of safety by the establishment of rating systems.
2. Development of safety propaganda such as that used by the California Industrial Accident Commission.
3. There has been, contrary to expectation, no unsatisfactory reaction upon business as the result of compensation legislation.
4. Introduction of a humanizing factor into industry.
5. Protection of the worker in case of accident.

Among the defects of present compensation legislation are:

1. Where the rights of the injured worker are left to the decision of law courts, the results have been in some cases unsatisfactory.
2. Except in four or five states, there is a limit to the amount of medical attention granted to workers under compensation laws.
3. The customary waiting period of from ten days to two weeks cuts off compensation from a large number of deserving cases.

4. Several states do not as yet require insurance so that workers may be deprived of the benefits of the compensation law.

5. Awards are inadequate.

6. Present compensation laws do not protect a sufficient number of workers. They should be made more comprehensive.

In conclusion the writer says, "The sum of it all is that the American compensation laws have proved fairly their beneficence but cannot be supposed to have attained their final forms." — C. H. Paull.

NOTICES AND CLAIMS UNDER COMPENSATION ACTS — I. *Chesla C. Sherlock.* Am. Machinist, March 4, 1920, 52, No. 10, 515–517. — This article deals with the technicalities incident to the reporting of accidents and the obtaining of compensation under the compensation acts. The necessity for prompt notification in case of accident is brought out in some detail. — G. M. Fair.

NOTICES AND CLAIMS UNDER COMPENSATION ACTS — II. *Chesla C. Sherlock.* Am. Machinist, March 11, 1920, 52, No. 11, 560–562. — Some rules for the filing of a claim for compensation are given in this installment. The need for close observance of the prescribed rules is explained. — G. M. Fair.

COMPULSORY HEALTH INSURANCE. *M. L. Harris.* Jour. Am. Med. Assn., March 27, 1920, 74, No. 13, 907–908. — Compulsory health insurance is an economic problem of first grade. There is scarcely a class of persons who would not be affected by it and the medical profession would be saddled with the obligation of carrying out the terms of the insurance. The arguments for compulsory health insurance are as follows:

"Compulsory health insurance is another step in the same direction as workmen's compensation acts, and if the latter are sound in principle and beneficial in their effects, the former, being but a step forward in the same direction, must likewise be sound in principle and beneficial in its effects. This conclusion is erroneous because of a lack of relation between the premises. The principle underlying workmen's compensation acts is definite and distinct, namely, injuries to workmen arising out of, and in the course of, their employment are a direct charge on the cost of production; but no such principle underlies compulsory health insurance. If accidental injuries to workmen were always preventable, it would be the duty of the state to enforce such rules and regulations as would effectually prevent their occurrence, instead of enacting laws to compensate the workmen in some manner for the damage done. It would not only be much cheaper to prevent the damage but infinitely more humane.

"Arguing along this line, the proponents of compulsory health insurance claim that as some diseases may be directly connected with the character of the work, all diseases in workmen should be compensated for the same as accidental injuries. There are many fallacies in this line of argument. In the first place, the diseases which are directly caused by the character of the work are very few indeed, and these can be readily prevented by proper working conditions. If a disease can be prevented by having proper working conditions, it is plainly the duty of the state to see that such conditions are provided, and not tax the people to cure a disease when it would be much easier and cheaper to prevent it. If there should be a disease which was caused directly by a particular line of work in an industry, and it were not preventable, then the care of a workman thus made ill should be a direct charge on the cost of production in the same manner as an accidental injury."

There are many economic conditions which have influence on the causation of disease, such as bad housing, overcrowding, inadequate diet, etc. Such conditions cannot be legislated against, and compulsory health insurance would be more likely to increase than to decrease the tendency to them by reason of the removal of restraint and responsibility for their betterment now resting upon the individuals in charge of industry.

"There are a few eminent members of our profession who believe compulsory health insurance to be desirable. These gentlemen have studied the subject from the point of view of the large city dispensary and clinic. They see a large number of poor people who visit these dispensaries daily and who, they believe, are not receiving adequate medical treatment. They argue that if all these patients were insured they would be able to pay the dispensaries for their treatments; the dispensaries would then be able to build up larger institutions, which could pay the attending physicians for their services, and thus provide the sick with better collective medical care. Any one who is

familiar with the dispensary evil and the suffering of the poor in the tenement districts of large cities will appreciate the point of view of the gentlemen who earnestly desire the betterment of the condition of these people; but isn't the dispensary question rather a local one? The same conditions certainly do not obtain throughout the country or even throughout a state. The commissions that have been appointed by several of the states to investigate the question of health insurance report that conditions vary greatly in different states and in different parts of the same state, and some of the commissions see no necessity for the adoption of compulsory health insurance. It will be admitted that the dispensary question and inadequate medical care of the poor in large cities are serious problems, and it is even possible that compulsory health insurance might bring temporary relief; but it would be at the expense of future harm. In matters of such weighty importance, isn't it a short-sighted policy that acts only for today and disregards tomorrow? Why should a measure that is ultimately detrimental in its effects be imposed on an entire country or state for the temporary relief of a condition that is local, and which should be remedied by prevention rather than cure? It should not be inferred from this that there are no poor in small communities; but the conditions are very different from those existing in large cities. Again, no measure of the magnitude and importance of compulsory health insurance, the effects of which are in any way doubtful, should be thrust on a people, for it is a well known fact that a principle once written into the law seldom becomes erased, and the baneful influence of such laws are cumulative, and eventually drag a people down." — C. K. Drinker.

Sickness Facts Indicate Urgent Need of Compulsory Health Insurance. *John E. Ransom.* Am. Labor Legis. Rev., March, 1920, 10, No. 1, 41–45. — Some of the interesting results of the study of the Illinois Health Insurance Commission are touched upon in this article. Of 4474 wage-earners, who played a part in the commission's investigations, 937, or 20.9 per cent., lost a week or more as a result of sickness. The average time loss of 901 of these cases was 7.35 weeks each, or 14.1 per cent. of the year. In the cases of 1667 families, sickness costs due to loss of wages and cost of medical service averaged $97.98 per family, and the cost burden was heaviest in the group receiving the lowest income. Among the group where there was a loss of at least a week's wages in the year, only 13.4 per cent. of the wage-earners received any sick benefits.

From these and other data, the writer concludes that:

1. The sickness problem is serious from the standpoint of loss of wages.

2. Sickness has grave social as well as economic aspects.

3. There is little insurance at the present time in Illinois which provides even partial indemnity for loss of wages, and there is practically none which provides medical care.

Just as workmen's compensation has led to a greatly increased interest in the safety movement, likewise universal health insurance will provide a powerful incentive to the prevention of disease. — C. H. Paull.

Life Insurance in its Relation to Thrift. *S. S. Huebner.* Ann. Am. Acad. Pol. Sc., Jan., 1920, 87, No. 176, 183–189. — The fundamental purpose of life insurance is pointed out as being the "capitalization of the value of human life," and through this means the protection of dependents or business interests against the loss of the value of that life through premature death. The writer advances the arguments in favor of life insurance under four headings:

1. Life insurance protects during the period when the individual is accumulating sufficient savings to guard dependents against his loss.

2. Life insurance is in itself a form of saving.

3. Life insurance involves regular and compulsory saving and is adapted to the saving of small sums. It stimulates the systematic laying aside of money.

4. Life insurance protects against the hazard of outliving one's income where policies are taken out on the "income plan." — C. H. Paull.

ABSTRACT OF THE LITERATURE

OF

INDUSTRIAL HYGIENE

VOLUME II AUGUST, 1920 NUMBER 4

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GENERAL

A UNIVERSITY COURSE IN INDUSTRIAL HYGIENE. *Robert T. Legge.* U. S. Pub. Health Ser., Pub. Health Rep., April 9, 1920, 35, No. 15, 891–893. — This article contains a syllabus of a lecture course in industrial hygiene as given at the University of California for the past six years. In order that the material may be grouped specifically, the subject matter of the course is treated in four parts as follows: (1) Temporary Industrial Centers: Mining, Lumber, Railroad, and Military Camps; (2) Factory and Occupational Hygiene; (3) Industrial Accidents and Safety Measures; and (4) Health Supervision, Welfare Work and Workmen's Compensation. The instruction is as practical and definite as it is possible to make it, fully illustrated by diagrams and lantern demonstrations, and is supplemented by visits to industrial plants for observation and criticism. — M. C. Shorley.

INDUSTRIAL HYGIENE: NEED OF RESEARCH IN CANADA. Prepared under the direction of the Committee on Industrial Fatigue. Pub. Health Jour., May, 1920, 11, No. 5, 216–220. — This article issued by a Canadian government committee is an official expression of Canadian recognition of the importance of industrial hygiene as a science based on the laws of physiology. After a brief survey of the present position of industrial hygiene, an account is given of the formation of the Committee on Industrial Fatigue — the name of which, since the issuance of this article, has been changed to Committee on Industrial Hygiene — and of the establishment of an intelligence bureau and library with offices in the Medical Building of the University of Toronto. The committee will be pleased to co-operate with similar bodies in other countries. Requests for information should be addressed either to the Chairman

(Professor J. J. R. Macleod) or to the Secretary, Committee on Industrial Fatigue, Medical Building, University of Toronto, Toronto. — R. M. Hutton.

PEACE-TIME PROGRAMME OF THE RED CROSS SOCIETY. *J. G. Fitzgerald.* MEDICAL CONFERENCE HELD AT CANNES, FRANCE, APRIL 1 to 11, 1919 — RECOMMENDATIONS AND RESOLUTIONS: REPORTS ADOPTED AND PRESENTED TO THE CONFERENCE BY THE SECTION ON VENEREAL DISEASES, THE SECTION OF TUBERCULOSIS, AND THE SECTION OF CHILD WELFARE. Pub. Health Jour., April, 1920, 11, No. 4, 149–175. — At a conference held at Cannes in April, 1919, and attended by delegates from Great Britain, France, Italy, Japan, and the United States, the League of Red Cross Societies drew up a peace-time program with the following objects: "the improvement of health, the prevention of disease, and the mitigation of suffering throughout the world." The Medical Conference, held at the invitation of the Committee of Red Cross Societies, approved of the peace-time extension of the activities of the Red Cross Societies and recommended the establishment of a Bureau of Health and Advisory Council in connection with the League of National Red Cross Societies. Certain resolutions and memoranda unanimously adopted were submitted by the conference for the purpose of indicating in a general way some of the lines of activity which the Bureau of Health might follow. These resolutions deal, among other things, with the control of typhus fever, the extension of child welfare work, the encouragement of scientific investigation in hygiene and sanitary science, the promotion of efficient public health administration, and the general adoption of the program proposed by the conference for the control of tuberculosis, malaria and venereal diseases.

Attached to this paper are the reports adopted and presented to the Medical Conference by the Section on Venereal Diseases, the Section of Tuberculosis, and the Section of Child Welfare. — R. M. Hutton.

NEED FOR STANDARDS FOR RECORDING AND CLASSIFYING DEFECTS AND IMPAIRMENTS. *John S. Billings.* Am. Jour. Pub. Health, May, 1920, 10, No. 5, 410–414. — An attempt has been made to show the needs for standard definitions of defects and impairments and the standard methods of classifying and tabulating them. Certain simple, somewhat arbitrary methods which have given satisfaction are described. The true object is to determine, not the total number of variations from the normal, but only those in which such variations really impair function.

Defects are defined as variations from the physical normal, which may or may not be impairments, either actual, potential or corrected. Impairments are defects which appreciably interfere with the proper performance of duty. Impairments well corrected, whether temporarily or permanently, are classified as defects for the time being. For the purpose of medical bookkeeping, only uncorrected impairments should be considered, and these should be classified as "correctable" or "non-correctable." These are tabulated on the basis of a standard classification under fifteen headings, and the severity is indicated by one or more plus signs.

The author suggests that this subject seems to be of sufficient importance to warrant a recommendation that a committee of the American Public Health Association be appointed to take up the matter in joint conference with a similar committee of the Association of Industrial Physicians, and to submit recommendations as to the best methods of securing uniform results. — H. F. Smyth.

HEALTH CONSERVATION PLAN. Nat. Civic Federation Rev., April, 1920, 5, No. 2, 9. — The social insurance department of the National Civic Federation recommends that special state commissioners study the extent, cause, prevention and treatment of sickness, wage loss, replacement, and extension of public health education. — G. E. Partridge.

THE MODERN SOCIAL HYGIENE PROBLEM. *Edith Houghton Hooker.* Survey, March 6, 1920, 43, No. 19, 707–712. — It is pointed out in this article that the modern social hygiene problem includes the following elements: (1) education, (2) recreation, (3) medical treatment, (4) law enforcement. One of the most important factors of the educational program is complete and frank publicity regarding the sources of venereal infection, together with the results both to the individual and to those with whom he comes in contact. In order to counteract the recreational aspects of unwholesome amusement, adequate facilities should be available for young people to enjoy themselves in

the best environment. Medical treatment has most to do with existing cases of venereal infection. Not only should the prostitute be treated, but also those who patronize her. Proper local facilities should be established for listing all cases of infection, and these should be followed up until a cure is effected. The activities of authorities issuing marriage licenses should be so co-ordinated with the work of listing cases of venereal disease that marriage involving infected persons could be prevented. The objects of a law enforcement program are outlined as: (1) the standardization of human sexual contact; (2) the making of individuals responsible for sexual conduct; (3) the protection of young of both sexes from seduction; (4) the making of marriage "the sole condition on which the state will tolerate sex relationship."

Among the important points in the present program of the American Social Hygiene Association are the reduction of exploitation of prostitution from paying to non-paying enterprise, the protection of feebleminded and minors, and the holding of the man who pays responsible for his part in commercialized prostitution. — C. H. Paull.

Community Responsibility for Physical Inefficiency. Editorial. Am. Physical Education Rev., Feb., 1920, 25, No. 2, 69–72. — An investigation by Newman shows that 1,000,000 persons of school age in England are so defective as to be unable to derive reasonable benefit from the ordinary form of education. The loss suffered by English workmen from preventable illness is very large. — G. E. Partridge.

Problems of Physical Education. *D. Snedden.* School and Society, May 8, 1920, 11, No. 280, 541–550. — The contemporary movement for physical education, like the similar movement for universal vocational education, is the product of aspirations, originating in the last quarter of the nineteenth century, for human conservation and increased efficiency. Physical training has four distinct aims: (1) to promote physical development; (2) to correct specific physical defects; (3) to establish special forms of strength, agility, and skill for the vocational (including the military) needs of life; and (4) to establish special forms of interest, skill, etc., for the non-vocational (including the recreational) needs of life.

There has been too little appreciation of the physical requirements of modern vocations of the non-combatant type. Industry as well as war exacts heavy penalties of the physically unprepared. It is an important question whether "all round" development is the best preparation for all occupations. Indeed, the evidence in its favor is far from conclusive. The prevailing exactions of the vocations must be studied. Of a thousand boys in a suburban high school, it can safely be said that 75 per cent. will enter upon brain work rather than upon manual vocations. Such facts must be taken into consideration. The diagnosis of social situations will also help. We know that a large majority of middle class girls serve for several years in non-manual vocations, after which they become home makers. These vocations make peculiar demands upon health, and they should be prepared for.

The usual physical training that prepares for intensive activities of competitive games will not be a good foundation for meeting the vocational strains — that we can predict with certainty. On the other hand, training that would promote full functioning of the heart, lungs, skin, kidneys, etc., and which would encourage motor poise might be of the utmost service. Prolonged but not arduous physical work might be one of the best means of preparation. Each vocation should be studied with a view to answering the following questions: (1) What are the physical strains it imposes? (2) How far can we prevent the most poorly adapted from entering upon it? (3) What specific training can we give against these needs? (4) What are the recreations that are (a) feasible and (b) desirable for the workers in this vocation? and (5) What training can we give that will produce interests and powers for suitable recreations offsetting the strains? — G. E. Partridge.

The Need for Vocational Guidance in Colleges. *J. M. Brewer.* School and Society, May 1, 1920, 11, No. 279, 511–517. — Vocational guidance can be conceived of as expressing itself in two ways: first, in equipping communities with the knowledge of occupational problems which is necessary for their civic well-being; and, second, in furnishing each individual with the skill he needs to guide his own personal destinies in the occupational world. Rightly conducted in either direction, vocational guidance will serve the other.

At the present time, vocational guidance finds itself handicapped by an educational dualism that makes a distinction between culture and the practical life. It is distrusted by the college faculty because it is feared that the student who thinks about his future work will be likely to choose his courses with that work in mind. In reality, it is vocational *education* that is feared by the college, and the counsellor joins the professors of the standard subjects in the belief that actual vocational education should be delayed. The vocational expert, however, does not fear that the student who thinks about his future will try to avoid breadth of education. In fact, it is found that even persons in the commoner occupations, once their pressing economic problems are solved, often reach out for cultural forms of education.

In concluding, the author makes the following recommendations: (1) A broad and cultural vocational guidance in college should provide the opportunity for the student to try his powers against a varied curriculum which relates itself directly to many occupational activities; (2) the college must give the student a better opportunity to study the occupational world; (3) the college student needs better guidance in choosing his calling, and the choice of an occupation can best be made by progressive elimination; and (4) if vocational courses are offered, guidance must accompany them. — G. E. Partridge.

Community Organization for Vocational Guidance. Report of the Committee to the National Vocational Association of the United States. Education, March, 1920, 40, No. 7, 447–452. — The writer urges the having of an ideal toward which to work. We need complete and detailed school census, showing attendance records; there should be psychological tests (which do not determine the abilities of individuals so well as they point out the educational needs of the specific group); there should be school scholarships, physical examinations, social case work, better administration of child labor laws, industrial surveys, educational and vocational guidance, placement, follow-up guidance. The first step for any city to take is to make a proper survey. The second step is to organize the work, if nothing further is done than to establish a central committee. — G. E. Partridge.

A Unique Plan in Vocational Education. *W. T. Carrington.* School and Society, April 24, 1920, 11, No. 278, 501–502. — The State Department of Vocational Education in Iowa, in co-operation with Kansas and Oklahoma, has planned a unique piece of trade education for men and apprentices in the Joplin mining district. Courses will be offered to foremen for the purpose of training them to teach the men under them while engaged in the work. It is argued that there is no other way of reaching a large number of men in the class of unskilled workmen. Plans for similar work in teaching home-making and also in agricultural education are proposed. The whole plan is to utilize the *best* in any trade, in any community, or in any group having similar intents and purposes, as instructors of others who have the same or similar problems. It is a process of building up from within rather than from without. — G. E. Partridge.

Eyesight in Connection with Education. *J. Kerr.* School Hygiene, Nov., 1919, 10, No. 3, 116–126. — This is a study of requirements for examination, criticism of methods, etc., and is useful from the point of view of the industrial hygienist. — G. E. Partridge.

The Dope Doctor. *Thomas S. Blair.* Survey, April 3, 1920, 44, No. 1, 16–20. — The writer reviews present conditions and tendencies in the prescribing and use of narcotics. Although there has been a marked dropping off in the harmful sale of narcotics since the passing of the Harrison Narcotic Law in 1915, it is still possible for many people addicted to the use of narcotics to obtain a certain amount. The obvious result of the passage of the Harrison Law is shown in the following figures for imports of narcotics. In 1915 there were imported into the United States 484,027 pounds of standard opium; in 1916, 146,658 pounds; and in 1917, 86,812 pounds.

The writer is convinced that at the present time "the dope-selling professional man is the main narcotic menace in this country." He bases this statement upon careful study which has brought him into contact with all sorts of illicit trade in narcotics. Frequently the professional dispenser of narcotics is of the old school and does not see the danger which is obvious to younger men in the profession. This fact coupled with a certain kind-hearted weakness has often made a respected practitioner a definite menace to the best interests of the community in which he lived. — C. H. Paull.

THE INCREASED INCIDENCE OF COCAINISM IN BERLIN. *Bruno Glaserfeld.* Deutsch. med. Wchnschr., Feb. 12, 1920, 46, No. 7, 185–186. — Before the war, the cocain habit was of small consequence in Germany as compared to the morphin habit. Lately, however, cocainism is more commonly seen, especially among returned soldiers. The author briefly describes an "underground" system of illicit drug traffic, by means of "wires" or pedlers, which is almost comparable to that with which we are already only too familiar in this country. He favors more stringent enforcement of the present laws regulating dispensing, although it is hard to see just how this will eliminate illicit traffic. — T. J. Putnam.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

THE IMPORTANCE OF TELLURIUM AS A HEALTH HAZARD IN INDUSTRY — A PRELIMINARY REPORT. *Marvin D. Shie* and *Forrest E. Deeds.* U. S. Pub. Health Ser., Pub. Health Rep., April 16, 1920, 35, No. 16, 939–954. — Incident to the increased production of tellurium it is reasonable to suppose that we shall encounter an increasing health hazard due to the more frequent exposure of the workers. This article takes up the manner of exposure, the mode of entering the body, the early symptoms of tellurium absorption, diagnosis, preventive measures, treatment, and the progress being made in laboratory work on this subject. The data presented were afforded by the study of seven men employed in a silver refinery. — L. A. Shaw.

THE DANGER OF CARBON MONOXIDE IN THE BURNING OF CHARCOAL. *H. Selter* and *Frankenstein.* Abstracted from Gesundh. Ing., 41, 126–127; and Chem. Zentr., 1918, 2, 59, by F. W. Tanner in Chem. Abstr., April 20, 1920, 14, No. 8, 1176. — "Contrary to the statements of von Recknagel, there is serious danger in burning charcoal in a room without a chimney. No difference in the amt. of CO formed in a room was found whether charcoal was brought into the room lighted or was kindled in the room. In both cases the amt. of CO formed was such that it might be a serious danger to health." — W. O. Fenn.

POISONING BY BARIUM CARBONATE. *Adolph Mayrhofer* and *Karl Meixner.* Wien. klin. Wchnschr., Oct. 30, 1919, 32, No. 44, 1068. — A case of accidental or suicidal poisoning with rat poison containing barium carbonate. The most characteristic symptom was the marked progressive weakening of the lower limbs. The barium salts affected mainly the smooth musculature in the body. Consciousness remained clear to the end. The danger is pointed out of mistakenly using a hydrochloric acid-soluble salt of barium for the sulphate or for bismuth in radiography. A review of the literature on barium poisoning is included. — Barnett Cohen.

POISONING BY ALCOHOL "DENATURED" WITH NITROBENZENE. *R. W. Scott* and *P. J. Hanzlik.* Jour. Am. Med. Assn., April 10, 1920, 74, No. 15, 1000. — "During the last Christmas holiday season a large number of dark, ghastly looking patients who had been drinking 'denatured alcohol' were brought into the City Hospital within a few days. As a rule they were unconscious. The dark, almost black, discoloration was limited mainly to the extremities, face and neck, including a fringe of the upper portion of the chest. In other words, the richly vascular, pigmented and dependent portions of the body were principally involved. The color was not the typical blue of ordinary cyanosis, but rather a livid, brown-black or nearly black, suggesting the presence of methemoglobin in the blood. Except for the deep narcosis and a moderately rapid pulse, the patients were otherwise practically normal. No other circulatory and no respiratory disturbances were detectable. After a deep sleep of about twenty-four hours, the patients left the hospital fully recovered. They did not seem to suffer, and there were no fatalities."

"Acute poisoning by alcohol 'denatured' with nitrobenzene, and containing a low concentration of formaldehyd, occurred in a number of cases. Although apparently low grade and nonfatal, there is considerable potential harm from such beverages when used over long periods, confusing at the same time the diagnosis of minor maladies." — C. K. Drinker.

A Coating for Poison Tablets for the Prevention of Accidental Poisoning. *Gray Phillips.* Mod. Med., Feb., 1920, 2, No. 2, 155–156. — A coating of wax has been tested as a means of preventing accidental poisoning from the swallowing of poison tablets; these tests show that tablets properly coated with wax will be recovered intact in the feces, thus resisting solution in the digestive fluids of the body. — L. Greenburg.

Rapid Method of Estimating Lead in Cassia Oil. *O. F. Lubatti.* Jour. Soc. Chem. Indust., Feb. 16, 1920, 39, No. 3, 35–36T. — A colorimetric method for determining lead (as sulphide) in cassia oil. Cassia oil is exported from China in lead cans, and contains 0.04 to 0.06 per cent. of lead. The maximum amount of lead taken up by oil in contact with the metal is 0.074 per cent. — C. H. Fiske.

DUST HAZARDS AND THEIR EFFECTS

Pulmonary Disease among Rope Workers. *Erich Ebstein.* Zentralbl. f. Gewerbehyg., Jan., 1920, 8, No. 1, 20–21. — Bernadino Ramazzini (1633–1714) recognized the danger to which workers in hemp and flax are exposed by inhalation of dust. Morgagni (1682–1771) performed autopsies on five persons engaged in this industry and observed inflammatory changes in their lungs. Morgagni and Ramazzini concluded that the persistent cough and asthma met with in hemp workers were directly attributable to the inhalation of dust. Hirt, in an investigation in 1871, states that 42.3 per cent. of all the sickness among such workers was of a pulmonary character. Koelsch claims that the hazard in the hemp industry is due mainly to the inhalation of hemp dust which produces cough, fever, and bronchial catarrh. Those engaging in this industry should be free from tuberculosis, nasal obstruction, flatfoot and varicosities. It is particularly important that these workers should not be mouth breathers. The greatest preventive measure against the pulmonary symptoms is thorough ventilation of the workrooms. — G. B. Wislocki.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

Efficacy of Normal Serum in Anthrax. *F. v. Hutyra* and *R. Manninger.* Centralbl. f. Bakteriol., 1te Abt., Orig., 1919, 83, p. 518. — Sera of normal horses, cattle or sheep fail to protect young rabbits against a subcutaneous injection of virulent anthrax bacilli, whereas immune sera protect satisfactorily. So-called normal sera, which are sometimes found to have a protective power, are probably the result of a latent, unsuspected infection in the animals from which they are derived. — Barnett Cohen.

The Blood Picture in Typhoid Carriers. *Gerhard Wodtke.* Centralbl. f. Bakteriol., 1te Abt., Orig., 1920, 84, p. 114. — The blood picture of the typhoid carrier is characteristically influenced by the toxin. There is a relative neutropenia and a considerable relative lymphocytosis, both of which are due to the action of the typhoid toxin as in the acute disease. Examination of the leucocyte picture may therefore be of value in the search for carriers. — Barnett Cohen.

Control of Typhoid Carriers by Examination of the Duodenal Juice. *Friedrich Schuman-Leclercq.* Wien. klin. Wchnschr., Oct. 30, 1919, 32, No. 44, 1074. — Bacteriological examination of the duodenal juice is necessary in addition to that of the stools and urine to pronounce a typhoid convalescent or carrier free from Bacillus typhi. The duodenal sound provides a ready means for securing the duodenal contents for such examination. — Barnett Cohen.

Etiology of Spanish Influenza. *C. J. C. van Hoogenhuijze.* Centralbl. f. Bakteriol., 1te Abt., Orig., 1920, 84, p. 88. — A bacillus, not quite like the Pfeiffer bacillus, was isolated from the blood of thirty-four cases and successfully cultivated on blood medium. This organism gave specific serologic reactions. It is

not pathogenic for laboratory animals. Inoculation experiments on man were not performed, but since this organism was found in the blood of numerous influenza patients early in the disease, and not in other cases, it is concluded that this was the etiological agent in the disease. — Barnett Cohen.

Pulmonary Tuberculosis in the Army. *Alexander Engel.* Wien. klin. Wchnschr., 1920, 33, p. 40. — Three-quarters of the German soldiers who were affected with pulmonary tuberculosis entered the army in good health, and of these, 80 per cent. contracted the disease in the field. Of the other quarter, who were sick on entering the army, 60 per cent. suffered an aggravation of the disease during military service. — Barnett Cohen.

Quinine Methylene-Blue Therapy in Malaria. *Rudolf Reitter.* Wien. klin. Wchnschr., 1920, 33, p. 9. — Methylene-blue alone is not effective in the treatment of malaria. However, in quinine-resisting cases (those that do not respond to quinine treatment) administration of methylene blue is successful against malaria. — Barnett Cohen.

Therapy in Ringworm Infection. *O. Sachs.* Wien. klin. Wchnschr., Dec. 18, 1919, 32, No. 51. — In superficial infections, simultaneous applications of tincture of iodine and ointment of ammoniated mercury are effective. In deep-seated infections, intravenous injection of 4 to 14 grams of urotropin in 40 per cent. solution is without danger and yields good results. — Barnett Cohen.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

The Alteration in Twilight Vision in Occupational Nystagmus. *L. Weekers.* Bull. Acad. Méd. Belgique, Sept., 1919, 29, No. 7, 1268–1276. — It is well known that hemeralopia (day-blindness) occurs independently from any ocular disease in cases of denutrition and fatigue. Dr. Weekers found at the ophthalmological clinic he had at the Belgian front that 9 per cent. of his cases were affected with hemeralopia, which he studied graphically with Nagel's adaptometer. Several facts pointed to fatigue as the origin of the trouble: the greatest proportion of cases belonged to the infantry, and were observed during the first year of the war, at a time when the Belgian army had made a continuous and desperate effort and when equipment was so deficient that many soldiers had to walk to the trenches in wooden shoes or even with no shoes at all. When in later years the army was re-equipped and the strain to which it was submitted lessened, the proportion of hemeralopia cases fell to 3 per cent.

Dr. Weekers thinks that these facts have to be taken into account in the explanation of miners' nystagmus, which he considers originates from several causes acting together: deficient illumination, overwork, cramped position, abnormal conditions in binocular vision, etc. — René Sand.

The Protection of Workmen against Injurious Lubricating Agents. *H. Fr. Ziegler.* Zentralbl. f. Gewerbehygiene, Jan., 1920, 8, No. 1, 11–14. — The necessity of using substitutes in Germany during the war led to the production and sale of a variety of lubricating substances which were injurious to health. These contained principally alkalies, tar oils and nitro compounds which irritated and injured the mucous membranes of the eyes, nose, throat, mouth and lower respiratory passages as well as oftentimes the skin itself. The writer advocates the passage of laws prohibiting the manufacture of injurious lubricants. He believes that these substances should conform to a certain standard which he defines by the following rules: The lubricant should be free from resins and acids. It should prevent rusting and not cause it. It should not possess a large quantity of insoluble ingredients which eventually clog the machinery, pumps, etc. It should not produce disagreeable odors. It should not attack metal, wood, leather or clothing. It should not be irritating to living tissue, nor produce eruptions of the skin, nor be injurious to small cuts or abrasions. — G. B. Wislocki.

Sweat-Band Burns of the Forehead among the Police of Königsberg. *Schemel.* München. med. Wchnschr., June 11, 1920, 67, No. 24, 700. — Thirty cases of burning and irritation of the skin of the forehead, and in a few cases of the hair-covered portions of the temples, resulted from wearing caps presumably with leather substitute sweat bands. The symptoms were a simple inflammatory reddening of the skin similar to a diffuse nascent eczema. One case, after three days, showed typical symptoms of herpes zoster. — M. D. Ring.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

A NEW PLAN OF ACCIDENT CONTROL. *David S. Beyer.* Safety Engin., April, 1920, 39, No. 4, 173–178. — Salesmanship is as necessary to the success of an accident prevention campaign in an industrial plant as it is to the success of any new proposition. A formula that is used in putting through the safety idea successfully is: (1) Get the attention of the manager by showing what accident prevention really means to a plant; (2) arouse his interest and convince him that he has such a problem by putting his own accident record before him in such a way that he will understand it and will compare it with the records of other plants in similar industries; (3) develop his desire for accident prevention by charts made up according to a standard method; and (4) get him to act. This result generally follows automatically from the use of charts. As soon as the management of a plant is shown that it is having a serious accident loss — particularly if its accident rate is higher than that of other plants in the same industry — action usually follows as a matter of course. Incidentally, from the standpoint of the employer, there is a legitimate satisfaction in the fact that where safety work is kept up for a period of years the insurance premium has been cut by 20, 30, 40, and even 50 per cent. of the average rate for his industry. — R. Thomson.

WORK, FATIGUE AND ACCIDENTS. *Ernst Guth.* Zentralbl. f. Gewerbehygiene, Jan., 1920, 8, No. 1, 1–7. — The writer concludes from a statistical investigation that:

1. A connection exists between industrial work and accidents since the number of accidents increases with the speed of production. The curve of accidents rises much faster than that of work. This is due to the preponderance of minor injuries.

2. The effect of fatigue is recognizable by the increasing number of severe accidents toward the end of the period of work.

3. The fact that severe injuries occur more frequently during the last hours of work, coupled with decreased intensity of production during this period, indicates that a reduction of working hours would be advantageous not only to the workers but to the employer as well.

4. The physical, mental, and moral qualities of the individual are an important factor in industrial accidents. Consequently, hygiene should be considered an important measure in preventing accidents. — G. B. Wislocki.

THE PSYCHONEUROTIC EFFECTS OF ACCIDENTS. *Martin Reichardt.* Deutsch. med. Wchnschr., Jan. 22, 1920, 46, No. 4, 89–92. — "1. Occupational and railway accidents can cause no lasting wage-earning disability, in so far as their psychic effect is considered, unless organic disease changes are instituted or made worse. In particular, they can cause no long-lasting psychoneuroses. Only individual reactions in the psychic sphere can arise after accidents, which, except for the emotion of fear, have a more or less psychopathic tendency as a starting point. The prognosis of these psychotic individual reactions to the accident is therefore favorable. Acute and even somatic symptoms are characteristic of the fright reactions, emotion, and psychic shock. The greatest dependence is to be laid upon the presence or absence of these acute symptoms, especially those of a somatic nature. The more pronounced the acute symptoms immediately after the accident and the more a typically psychotic clinical picture is established, the longer are the effects of the accident to be expected to last. By far the majority of fright emotions disappear in four weeks. Fear neuroses of more than a half year's duration do not occur in civil accidents.

"2. In particular, there are no true traumatic neuroses, accident neuroses, traumatic neurasthenias, or traumatic hysterias in the literal sense, lasting for years. The longer a purely functional psychoneurosis, apparent or real, lasts after an accident, the more is it to be predicated that the accident cannot be the cause of it. This is especially true if the disturbance is of long standing and has progressively increased, and if striking, acute, somatic symptoms in the sense of shock have been lacking. All long-lasting psychoneurotic disturbances without very striking acute symptoms may be separated at once from the effects of accidents. But even when there has been shock in the first place, long-lasting psychoneurotic conditions without objective anatomical or somatic symptoms are usually not the result of accidents.

"3. In regard to the psychoneurotic symp-

toms which arise coincidently with accidents covered by insurance, psychological and psychopathological analysis is not alone necessary. It is essential to inquire thoroughly whether they are to be considered as consequences of the accident. . . . A large proportion of the psychoneuroses formerly considered traumatic have actually nothing to do with the accident. Such derangements usually develop slowly by themselves, coincidently with the injury, without acute symptoms; they therefore preserve their thought-method and content in spite of the accident. But the greater number of the so-called traumatic neuroses in the older sense are psychological or psychopathic reactions to the insurance proceedings. These may also have the characteristic slow progressive course, while the real traumatic derangements of a psychic nature are regressive.

"4. Whether the so-called 'insurance neuroses' are fundamentally the results of an accident, is properly a judicial question. The judgment of the highest authorities should here lead to a unified opinion. The present psychological view of the nature of the 'insurance neurosis' would be adequate, if the individual or psychopathic reactions to the insurance proceedings were not considered as consequences of the accident covered by the insurance. By this means would the struggle against the 'insurance neurosis' be most suitably carried on, and it would be forestalled at the earliest possible moment (prophylactic treatment of the 'insurance neurosis'; appropriate education of the psychopath). To be sure, definite legal powers would be necessary. From the medical standpoint, only a very small proportion of the 'insurance neurotics' are really damaged in earning power. So the medical profession should not be too soft-hearted. In the majority of cases it is a question of suggested symptoms, hypochondriacal ideas, querulent reactions, will-defects, hysterical or conscious exaggerations and simulations, which still fall within the realm of normal psychology, and do not lead to any definite disability. An appreciable proportion of people with psychopathic reactions to the insurance proceedings should still, however, be regarded as sick from the medical standpoint. Among these belong, in the first place, those with pronounced lasting, and evidently abnormal somatic symptoms, not merely the simple sensations formerly called bodily symptoms. As long as these are evidently reactions to the insurance proceedings of a hysterical, hypochrondriacal, or purely suggested nature, they are fundamentally adapted to compulsory medical (psychotherapeutic) treatment. The possibility of such compulsory treatment for an indefinite time, until the patient is well, must be legally established, if the psychopathic reaction to the insurance proceedings be recognised as a consequence of the accident. . . .

"5. It is extremely necessary that the medical profession should come to a fundamentally unified view of the nature of psychoneurotic symptoms following accidents to insured persons. The profession must stand together in the struggle against psychopathic reactions to insurance proceedings. . . . The experience of the war, the extraordinarily great resistance of the human brain against psychic influences, the slight etiological rôle which is played by single psychical incidents in the sense of injuries, all show the way by which a unified comprehension of these 'social neuroses' is obtainable." — T. J. Putnam.

Air Conditioning Prevents Explosions Ignited by Static Electricity. Chem. and Metall. Engin., March 31, 1920, 22, No. 13, 614. — Plants handling quantities of chemicals can be protected against chance explosions due to static electricity by a proper modification of the factory air. Dry air increases the possibility of static discharge. — G. M. Fair.

A Man at the Bench Is Worth Ten in the Hospital. *James A. Reed.* Factory, April 15, 1920, 24, No. 7, 1141–1144. — The somewhat unusual experience of the Mare Island Navy Yard in reducing accidents is briefly discussed in this article. In spite of an increase in the working force from 3651 to 9500 employees, it was possible to reduce the number of accidents materially in a period of twenty-six months between July, 1917, and September, 1919. The rate fell from 1.26 accidents per 100 employees to 0.35.

Although a safety committee had been in existence for some time at the Navy Yard, its work had not included campaign activities and advertising. With the advent of a safety engineer, a thorough scheme of publicity was introduced. Safety bulletins were located at strategic points, suggestion boxes were put up, and employees encouraged to make contributions. A system of safety guards was organized. These safety guards were men selected for their

special ability. They were given authority to caution and direct fellow-workers who were indulging in unsafe practices. Similar precautions were taken in the case of fire, and a brigade of rescue men was organized. — C. H. Paull.

Some Recent Improvements in Miners' Electric Lamps. *William Maurice.* Tr. Institution Mining Engineers, March, 1920, 59, Part I, 2–19. — A description of the latest developments in the design of electric lamps for mine workers. — G. M. Fair.

INDUSTRIAL SURGERY

The Technic of Nerve Suture. *Byron Stookey.* Jour. Am. Med. Assn., May 15, 1920, 74, No. 20, 1380–1385. — A general summary description of the author's methods for handling problems of nerve suture in different parts of the body. — C. K. Drinker.

The Treatment of Injuries to Athletes. *Harry Eaton Stewart.* Jour. Am. Med. Assn., April 3, 1920, 74, No. 14, 947–948. — The application of methods of physiotherapy tested out in the army and Public Health Service hospitals has proved very useful in injuries sustained in the "vigorous fighting games of youth." Stewart describes methods of treatment used in the following classes of injuries, all of which occur rather prominently in industrial practice:

1. Muscle bruise. — Relaxation, firm bandaging and rest for twenty-four hours at the end of which time baking or, better, high frequency current may be used. Massage is begun upon the second or third day.

2. Torn ligaments. — Relaxation, partial protection, guarded but constant use.

3. Torn muscle insertions. — Complete relaxation for two weeks then guarded use, care being taken not to tear away the newly formed muscle attachment.

4. Subperiosteal hematoma. — Rest and firm bandaging followed by the use of heat and massage.

5. Tenosynovitis. — If acute, absolute rest, heat and gentle stroking, with more prolonged and intense heat and massage later. — C. K. Drinker.

Infections of the Upper Extremities. *P. A. Bendixen.* U. S. Bur. Labor Statis., Month. Labor Rev., Nov., 1919, 9, No. 5, 327–335. — In this brief paper read at the sixth annual meeting of the International Association of Industrial Accident Boards and Commissions, held at Toronto, Canada, Sept. 23–26, 1919, the writer gives a general survey of the causes and treatment of infections of the upper extremities. He believes that "90 per cent. of the arms, hands, and fingers could be saved if care and judgment were used in the proper handling and management of these cases." The writer's statistics are based on his personal observation, during the years 1917 and 1918, of 1696 injuries to the upper extremity. — R. B. Crain.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

Prevention of Fatigue in Industry — III. Reduction of Necessary Fatigue. *Reynold A. Spaeth.* Ind. Management, March, 1920, 59, No. 3, 215–217. — The writer points out that without altering a job in any way it is possible to reduce the fatigue involved in it by making a careful selection of workers with adequate resisting powers. To determine who these workers shall be involves careful physical, physiological, and psychological analysis to fix standards in the case of specific jobs.

Among the first questions which arise is that of muscular exertion required in a job. The spring balance method of Lovett and Martin is recommended because of the simplicity of the apparatus required and the ease with which the test can be given.

In determining physiological efficiency, a test based upon variation in blood pressure and heart action after exertion is effective. Dr. Crampton has outlined the procedure and method of using data in such a test. His rating table is reproduced. Up to the present time no satisfactory endurance test has been devised.

The writer suggests, however, that a definite correlation may be found between physiological efficiency and endurance.

One of the most important elements in developing fatigue tests is to make both management and worker appreciate the practical and personal value of such tests. Unfortunately, the medical examination has in some cases fallen into disrepute among workers, because it has been used for illegitimate ends. Only by the most intelligent and sincere presentation of the case of fatigue tests will their real significance be understood. — C. H. Paull.

A New Method for the Diagnosis of Fatigue Following Muscular Effort, the Palmograph. *Ernst Brezina.* Arch. f. Hyg., 1920, 89, Nos. 1, 2, and 3, 1–26. — The author describes a simply constructed apparatus which registers as deviations from a horizontal line all tremors of a subject's hand as he attempts to make contact between a copper tipped pencil and a metal plate in the bottom of a small circular opening in a vertical plate. This makes a permanent record or curve on a revolving drum. Various factors as to time, extent and number of the deviations were studied and the average sum of the maximum vertical deviations in a series of ten to twenty-five tests was taken as the factor giving the greatest amount of information.

Among the conclusions reached after an extended study of the method on various test subjects are the following:

No subjects give a straight line curve with no evidence of tremors.

Exhausting bodily effort increases the extent of the deviations to a greater or less degree not always proportional to the amount of work done.

Intensive effort for short periods is followed by a rapidly developing increase in the curve with a quick subsidence to normal.

Continued severe industrial effort over long periods (a year or more) produces continued increase in the extent of the deviations which may be further temporarily increased by added acute effort.

Subjective fatigue sensations show no definite relation to the curves developed by the palmograph.

It is hoped that further study may show a definite relation between increase in the deviation curves and the development of chronic fatigue. — H. F. Smyth.

The Influence of the Week on the Ebb of Human Energy. *Ernst Brezina.* Arch. f. Hyg., 1920, 89, Nos. 1, 2, and 3, 27–46. — This paper is a statement, based on statistical studies on schoolchildren and adults, of the value of a weekly rest day in overcoming the cumulative effects of fatigue from the daily tasks, provided the rest period does not include an increased indulgence in alcoholic liquors.

The author advocates an attempt to encourage among workers a better method of employing the week-end rest period rather by example, education, and direction than by legal restraints. — H. F. Smyth.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION. ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

The Sanitation of Factories for Chemical Products. *Paul Razous.* Abstracted from Industrie chimique, 1919, 6, 329–332, by L. G. Smith in Chem. Abstr., May 10, 1920, 14, No. 9, 1401. — "In this paper R. discusses methods of sanitation under the head of methods of protection against factory dust, vapors and moisture, contact with irritating and caustic materials; numerous devices used to obtain these results are described. For fine dust of oxides, sulphates, sulphides, obtained from roasting or treating ores of silver, tin, copper, lead, zinc, etc., the electrical pptn. method operated under the Cottrell patents has been very successful. The drying of air by H_2SO_4, CaO and $CaCl_2$ is discussed and the qualities of these three are compared in regard to power of absorption of water vapor, and convenience. Power ventilation, with control of humidity by temp. regulation and adjustment to meet weather or seasonal conditions, are recommended. A diagram of a shop equipped to eliminate moisture or fog is given. Operations which produce large amts. of moisture in the air are gathered into one room. Openings direct into the outside air are closed. The roof is double, with an insulating air space of 35 cm. The room is 5 M. high. Air is conveyed from a neighboring place through a wooden duct heated by steam pipes, which can be closely regulated by the adjust-

ment of hand valves. There are numerous small rectangular openings in this wooden duct running around room, just above the dye baths. The openings are horizontal and are controlled by valves or flaps swinging on a horizontal axis, driving the incoming current of air upwards toward the ceiling or downward towards the floor. A large part of the rest of this article is devoted to the description of devices for raising, conveying, and manipulating corrosive liquids. The pumps, elevators, injectors, and siphons described are the same in principle, if not in pattern, as the devices used for similar purposes in this country." — W. O. Fenn.

Fundamental Principles of Illuminating Design — II. Light Distribution. Am. Arch., April 15, 1920, 117, No. 2312, 479–481. — A discussion of the theory of light reflection, diffusion, and refraction, and its application to illuminating design. Tables of coefficients of light utilization and technical data on Mazda lamps are given. — G. M. Fair.

Proper Illumination a Factor in Increased Production. *Otis L. Johnson.* Electrical Rev. (Chicago), May 8, 1920, 76, No. 19, 761–763. — Proper selection, location, and use of lamps and reflectors tend to increase the efficiency and morale of workmen, to decrease waste and spoilage of materials, and thus to increase production. — G. M. Fair.

Relation of Electric Lighting to Safety. *A. B. Oday.* Electrical Rev. (Chicago), May 8, 1920, 76, No. 19, 764–766. — A discussion of the magnitude of the safety question, including statistics of accidents and the influence of lighting in affording safety in industrial plant operations and in the streets. — G. M. Fair.

Recent Advances in the Science of Ventilation from the Industrial Standpoint. *George G. Nasmith.* Pub. Health Jour., May, 1920, 11, No. 5, 197–206. — This article, based on the fact that air temperature and air humidity have profound effects on the human organism, is an argument for the establishment of efficient ventilation systems in industries. The writer refers to the development in the knowledge of ventilation made during the past few years. In particular, he quotes the findings of Paul in 1905, which have since been confirmed by numerous other scientists, namely, that "the symptoms arising in vitiated atmospheres are due to heat stagnation in the body, and the moisture of the atmosphere, its temperature and its stillness are responsible for the effects produced."

From the results of various investigations and experiments it has been found that "in general a moderately cool and moderately dry air in motion is the most beneficial to the human body. A temperature of from 65 to 68 degrees Fahrenheit, with a relative humidity of not more than 50 per cent., is about the best where great physical labor does not occur."

The ideal system of ventilation should accomplish the following: "It should first of all maintain the air at a proper temperature and humidity; it should keep the air in gentle motion; it should remove odors, bacteria, dust and other contaminating substances, such as gases, and should provide a sufficient quantity of fresh air to remove all products of respiration." Looking at the matter from the commercial point of view, on the basis that better health means greater output, the writer considers that "it would probably pay well to install in almost every new factory the most modern ventilating system and employ an up-to-date engineer at the single task of watching the ventilation with the efficiency of the worker in mind." — R. M. Hutton.

Solution of Lead in Drinking Water. *Alberto Scala.* Ann. d'ig., Jan., 1920, 30, No. 1, 35–44. — A necessary condition for the solution of the lead is that the water contain mineral or organic acids, while the corrosion is due to the free oxygen contained in the water. Waters containing certain salts in solution have an inhibitory action on the solution of the lead. A 0.25 per cent. solution of potassium nitrate will prevent the lead hydroxide formed on the surface of a lead sheet of 33.04 sq. cm. immersed in 100 c.c. of the solution from passing into solution in the water. Ammonium nitrate, on the contrary, will favor the corrosion of the solution of lead hydroxide in the water. The action of the oxygen in the corrosion of the lead may be expressed by the formula:

$$Pb + 2H_2O \rightleftarrows Pb\begin{matrix}OH' - H' \\ OH' - H'\end{matrix} + O \leftarrow Pb\begin{matrix}HO \\ HO\end{matrix} + H_2O.$$

— E. Ciampolini.

The Action of Water on Lead. *J. F. Liverseege* and *A. W. Knapp.* Jour. Soc. Chem. Indust., Feb. 16, 1920, 39, No. 3, 27–33T. — Three varieties of action of water on lead are

distinguished: (1) erosion (the formation of a flocculent precipitate, leaving a bright lead surface); (2) corrosion (the irregular appearance of a white crust); and (3) the formation of a dull whitish protective coating. Erosion occurs in the presence of oxygen when the alkalinity of the water is between 0.2 and 1.5 (parts of $CaCO_3$ per 100,000 of water); corrosion occurs when the alkalinity is between 1.5 and 2.5; when the alkalinity is greater than 2.5, a protective coating is formed. Erosion was measured by immersing bright lead strips in water, under standard conditions, for one day and estimating the lead removed from the surface by colorimetric determination as sulphide. Erosion is due to the action of oxygen, and is limited by the amount of oxygen in the water, besides being diminished by the presence of alkali (two parts of calcium bicarbonate per 100,000 prevent it). Erosion occurs in the absence of bacteria, and in the absence of CO_2. The presence of 1 or 2 per cent. of CO_2 causes a sudden change from erosion to plumbo-solvency. — C. H. Fiske.

Operating Experiences with Activated Sludge Process for Factory Wastes. *George W. Fuller.* Canad. Engineer, April 8, 1920, 38, No. 15, 367–368. — A novel method of adapting the activated sludge process to local conditions has resulted in securing satisfactory results in the treatment of industrial wastes from a plant for the refining of cocoanut oil and the manufacture of cooking oil, soap bases, and butter from cocoanut oil and milk products. Mr. Fuller has taken Mohammed to the mountain by supplying sludge to wastes which would not produce any themselves, thereby clarifying a liquid which could not be treated satisfactorily by other methods. — G. M. Fair.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

Medical Service in Hotels. *E. M. Statler.* Mod. Med., Feb., 1920, 2, No. 2, 102–103. — A description of the medical department of the Hotel Pennsylvania which consists of an operating room, emergency ward, X-ray room, pathological laboratory, and a special treatment room for eye, ear, nose and throat work. Separate consultation rooms are provided for employees and guests. The medical staff consists of a full-time and a part-time physician, and a nurse. A two-hour daily clinic is held for employees, which takes care of an average of fifty to sixty cases daily. — L. Greenburg.

Dental Division of the Metropolitan Life Insurance Company. *T. P. Hyatt.* Mod. Med., March, 1920, 2, No. 3, 237–240. — The author discusses the results of the operation of the company's dental department for the past five years. The results of the operation of the prophylactic station have been so encouraging that every Home Office employee will henceforth be required to undergo examination and cleansing of the teeth twice each year. While this is not a statistical paper, statistics are quoted, however, which tend to show the enormous effect of dental conditions on systemic conditions. Record cards for dental examinations are shown which should prove of considerable value to industrial dentists. — L. Greenburg.

INDUSTRIAL INVESTIGATIONS AND SURVEYS

Preventable Death in Cotton Manufacturing Industry. *Arthur Reed Perry.* U. S. Dept. Labor, Bur. Labor Statis., Bull. 251, Oct., 1919, pp. 534. — This is a report upon the death hazard and contributory factors among the workers of a large cotton manufacturing center. Fall River was chosen as an especially appropriate field for such an investigation. The study emphasizes the death-rate method as yielding much more reliable evidence of hazardous conditions than any possible estimates of morbidity rates. Attention is called to a common fallacy in similar studies which often neglect non-casualty deaths.

The period covered by this investigation includes the five years from 1908 to 1912, inclusive. Data for operatives are drawn from scheduled information specially obtained from the cotton mill employees of Fall River, and from Fall River death records for the same period. Information respecting the total Fall River population is taken from the federal

census records. To insure valid comparisons, adjusted death rates only are used in the final reports.

In the body of the report appears a detailed study of mortality in a variety of relations, by age groups, sex, nativity, race, conjugal condition and special industrial factors including the principal jobs represented by the cotton manufacturing industry. Mortality is presented also in its relations with a variety of specific causes embracing both accidental violence and disease. Special attention is given to deaths from tuberculosis and parturition. Comparisons are made throughout between corresponding operative and non-operative mortalities.

A final portion of the discussion is devoted to contributory causes, such as alcoholic addiction, tuberculous kindred, unhygienic dwellings, low income, overwork, profligacy, and poor heredity. Supplementary to the report is a series of more than fifty tables presenting the mortality statistics in the various relations discussed in the body of the report. From the studies it appears that spinning-room work heads the list of hazards among the special branches of the industry. Tuberculosis is conspicuous within the industrial age groups as by far the most common single cause of death as well as an important factor in raising the industrial death rate above that of the non-operative population. The high death rate from parturition is probably dependent upon environmental factors conditioned by the existing factory system. — H. W. Stevens.

INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS: SPECIAL TESTS IN THE SELECTION OF EMPLOYEES

Adult Tests of the Stanford Revision Applied to College Students. *Helen H. Caldwell.* Jour. Educational Psychology, Dec., 1919, 10, No. 10, 477–488. — The correlation of the test results with scholastic standing is such that the adult tests may be useful to advisory officers in diagnosing cases of unsatisfactory scholarship. — G. E. Partridge.

The Will-Profile. *June E. Downey.* University of Wyoming Bulletin, 15, No. 6a, pp. 37. — A tentative scale is offered for measuring the amount and character of volitional power possessed by an individual. The tests used are tests of handwriting, and provide data about speed of decision, co-ordination of impulses, freedom from inertia, speed of movement, tenacity, flexibility or adaptability, accuracy. No correlation was found between will-pattern and intelligence. — G. E. Partridge.

Intelligence Tests of Yale Freshmen. *J. E. Anderson.* School and Society, April 3, 1920, 11, No. 275, 417–420. — Of the college freshmen, 99.2 per cent. of the men received A and B grades, while 83 per cent. of the officers and only 20.4 per cent. of enlisted men received these grades. The A and B ratings were considered by the army as indicative of the officer type, providing leadership and other necessary qualities were present. The scores of the Yale men are compared with those of college students in other institutions who have been subjected to the same tests. Correlations have been worked out, showing that while there is a positive correlation between standing in the army tests and standing as measured by the records of a half year in college, the correlation is not high enough to be regarded as reliable in application to any individual for the purpose of predicting the future. The article contains data of interest to the practical psychologist in general. — G. E. Partridge.

The Army Tests and Oberlin College Freshmen. School and Society, March 27, 1920, 11, No. 274, 389–390. — The tests were given exactly as they were administered in the army. The median score for men was 153, and the median score for women, 145, the difference being explained as due to the prominence, in the test materials, of experiences more common among men than among women. — G. E. Partridge.

Significance of the Army Intelligence Tests. *R. Dodge.* Education, March, 1920, 40, No. 7, 417–428. — The army tests were valuable aids in measuring intelligence, but many other factors need to be tested in order to determine capacity for special tasks — morale,

enthusiasm, loyalty, perseverance, etc. For these there are no adequate tests in sight. Nor have we any proper estimates of the proportion of such characteristics needed for various tasks. These limitations make scientific vocational guidance at the present time impossible. It is wholly impossible to establish now any simple formula of routine tests for capacity to learn any task — military, educational or industrial. We can test actual accomplishment — information and the ability to use it — but the correlation of accomplishment with the capacity for further development is not so readily determined. When large groups are to be studied with reference to any capacity and must be quickly tested, any quantitative measure is better than none at all, and of all the methods probably the tests for general intelligence are the most useful, but such tests may be grossly misleading so far as any individual is concerned. — G. E. Partridge.

Observations on the De Sanctis Intelligence Tests. *W. B. Drummond.* Brit. Jour. Psychology, March, 1920, 10, Nos. 2 and 3, 259–277. — The primary object of the De Sanctis tests differs from that of the Binet tests: the Binet tests are intended to measure the amount of intelligence; the De Sanctis tests are planned to measure the degree of mental defect. The tests are described in detail, and results are given of their application to normal children. The conclusion is that the tests cannot differentiate between the feebleminded and the normal. Feebleminded persons with a mental age of nine years may pass all the tests. The tests do, however, afford a rapid means of classifying the mentally defective. The De Sanctis tests may be utilized as substitutes for some of the tests of the Binet scale, but cannot take the place of the Binet scale. — G. E. Partridge.

Psychology and Industry. *C. S. Myers.* Brit. Jour. Psychology, March, 1920, 10, Nos. 2 and 3, 177–182. — In industry, including commerce, there are four main themes to which psychology can profitably be applied: fatigue, movement study, vocational guidance, and management. The psychologist, by a long series of experimental studies, has prepared the way for systematic investigation of industrial fatigue. Movement study has as yet scarcely been touched by the psychologist. The field has been occupied mainly by the "industrial efficiency" expert, whose methods have been largely empirical. The study of vocational guidance is founded on that of individual differences, for the basis of which we are indebted to pure experimental psychology. As an example of the application of psychology to industry there are the reaction time tests of workers in a bicycle-ball factory, by which it was discovered that by proper selection of workers thirty-five individuals could do the work that had previously been done by 120.

It is easy to devise tests of manual dexterity. Psychological tests of foresight are also readily devised, and have been applied successfully in investigations on motor tram-drivers. Tests of sensory acuity and discrimination, of artistic endowment, fatiguability, accuracy, neatness, distractibility, improvability, memory for names and faces, powers of observation, accuracy and speed of reasoning, and general information are also available. The objection that such tests do not throw light on moral qualities, etc., is not sound. Moral qualities are tested and the tests are easily supplemented by individual examination and cross-questioning.

Under the application of psychology to management must be included consideration of the causes of industrial discontent and restricted output, of the advantages of different methods of payment and supervision, and of other conditions that affect the efficiency and happiness of the workers. There is much also in the newer psychology of emotions awaiting direct application to industrial problems.

The British Psychological Society is now to consist of three special sections, devoted respectively to education, industry and medicine, and a general section devoted to other aspects of psychology. — G. E. Partridge.

Correlation of Physical Health and Mental Efficiency. *R. L. Sandwick.* Jour. Educational Research, March, 1920, 1, No. 3, 199–203. — Mental power as determined by an intelligence test was compared with the condition in regard to physical defects of 423 students attending a high school. It was found that the defects among the most intelligent group were fewer in number and less serious in character than those among the group that was inferior intellectually. "Although the number of cases is small the investigation adds something to the accumulating evidence that the child of good intellectual ability is also of good physical ability." — G. E. Partridge.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

THE FINDINGS OF OFFICIAL HEALTH INSURANCE COMMISSIONS. *John A. Lapp.* Am. Labor Legis. Rev., March, 1920, 10, No. 1, 27–40. — "Compulsory health insurance in 1920," asserts the writer, "is in about the same relation as workmen's compensation for industrial accidents was with regard to legislative adoption, in 1910." On January 1, 1920, commissions in eleven states had considered workmen's health insurance. Four of these commissions — those in California, Ohio, Pennsylvania, and Illinois — carried on thoroughgoing studies of problems involved in health insurance. The California commission as a result of its careful work concluded in substance that: "Social insurance represents an effective means of counteracting some of the harmful effects of sickness under existing conditions; social insurance is almost world-wide in its application; . . . the prevention of sickness goes hand in hand with such insurance."

Prior to 1919 there was a marked tendency to report favorably on health insurance. By that year, however, the writer points out, certain commercial insurance interests were beginning to carry on a more or less active propaganda against the health insurance idea. Commissions seem to have become less optimistic in recommending health insurance. The Wisconsin commission recommended preventive measures rather than a scheme of indemnification.

Among the standards laid down by the California commission which reported unanimously in favor of health insurance are the following:

1. Insurance must be both voluntary and compulsory but as to at least a very large part of the insured, it must be compulsory.
2. The sole carrier of the medical benefit should be the state, but the cash or wages benefit should be carried either by the state, or by a fraternal union, at the option of the insured, but not by private commercial companies operated for profit.
3. Medical benefit should include the worker and his dependent family.

The Ohio commission reported in favor of compulsory health insurance. It recommended the distribution of the cost between the employer and the employee. Benefits to the worker should include: (1) cash payment of part of wages, (2) medical care as required, (3) provision for rehabilitation, (4) dental care, (5) medical care of dependents, (6) burial benefit for the worker.

What was probably the most careful investigation was that of the Illinois commission. In one of its studies it collected data from 3,048 families living in Chicago. In summing up its complete findings the commission called attention to facts such as the following:

1. That approximately two-thirds of the wage-earning families will have one or more cases of serious sickness or non-industrial accident in the course of a year.
2. That something more than a quarter of the wage-earners will be sick or sustain non-industrial accident in the course of the year.
3. That loss of time to wage-earners will average between 8 and 9 days per year for each wage-earner in the entire group.
4. That the average loss in wages and medical bills connected with sickness and accident will approach $75 per year per family when spread over the entire group.
5. That sickness and non-industrial accident are found as a cause or as an accompanying condition of dependency in from a third to half of the cases of dependency not giving rise to institutional care.

Among the findings of the Pennsylvania commission is the one that "industry is clearly responsible for a large proportion of illness among employees. . . . Full one-half of the existing sickness could be eliminated if proper preventive measures were taken."

In conclusion the writer expresses the conviction that existing reports of health insurance commissions are sufficient evidence in favor of adopting compulsory health insurance. — C. H. Paull.

STATE ACCIDENT INSURANCE IN AMERICA A DEMONSTRATED SUCCESS. *Miles M. Dawson.* Am. Labor Legis. Rev., March, 1920, 10, No. 1, 8–14. — As a result of investigations of workmen's compensation in Ohio, Pennsylvania, and New York the writer comes to the conclusion that state funds, particularly the exclusive fund, are superior to insurance provided by commercial carriers. In the states under consideration three types of insurance were involved: (1) exclusive state funds; (2) competitive state funds; (3) private profit-making companies. Attention is called to the low expense of management required for carrying on state compensation insurance. In commercial stock insurance companies the ratio of management expense to premiums often runs as high as 35 to 40 per cent. When this figure

is compared with the ratio for the state fund in Oregon of $7\frac{1}{2}$ per cent., the saving in this particular element is obvious. In Ohio, where the state fund is exclusive, an even lower ratio than this was found by the writer. The following table points out the ratio of management expense to premiums in the three states under consideration:

	Ratio of management expense to premiums Per Cent.
Commercial Stock Insurance Companies...	35–49
Pennsylvania state fund (competitive).....	9
New York state fund (competitive).....	6.2
Ohio state fund (exclusive).....	1.625

This saving in management cost obviously reacts upon the premium rates. The New York state fund, for instance, reduces the premiums of policy holders 29 per cent. below what they would have to pay to commercial insurance companies. In Pennsylvania the saving is from 19 to $23\frac{1}{2}$ per cent., and in Ohio where the cost of administration is taken from the state treasury instead of from premiums the saving is at least 35 per cent. The insurance funds of the three states under consideration all have sufficient surpluses to provide for contingencies.

Among the possible defects to be found in a state compensation fund is the danger that economy will be carried to such an extreme as to hamper the development of adequate machinery for the administering of the fund. In Ohio, for instance, there seem to be delays in making awards. In New York State there seems to be the danger that adequate accounting and following up of cases are sometimes neglected.

The writer, however, comes to the general conclusion that although minor abuses may rise out of the present administration of state funds they are, in all essential elements, superior to commercial insurance. In discussing the question of the opposition of certain employers towards state insurance, it is pointed out that in some cases there is a suspicion of any activity carried on under public control. There also seems to be a certain antagonism on the part of some manufacturers opposed to legislation leading to the improvement of industrial conditions. — C. H. Paull.

Disabilities as Aggravated by Pre-existing Conditions. *John W. Mowell.* Mod. Med., Dec., 1919, 1, No. 8, 683–687. — Congenital defects, hernia, partial blindness or deafness, chronic joints, foot troubles, syphilis, goiter, and feeblemindedness are all involved in accident cases and create difficulties in coming to a decision of fair compensation. They often influence the treatment and prognosis of injury and illness in industrial plants. The writer concludes that only by having as complete data as possible in the insurance office concerning each worker can the problem be entirely solved. — A. B. Emmons.

Compulsory Sickness Insurance. Nat. Civic Federation Rev., April 1, 1920, 5, No. 2, 6–8. — This report of the Social Insurance Session of the Annual Meeting of the National Civic Federation contains condemnation of the British Act from various points of view. The main objection on the part of organized labor is that the benefits are inadequate. The objections are also expressed that sickness is too indefinite a term, and that too many people would become addicted to the habit of "being on the funds." Other arguments are offered against the measure from the employer's point of view. Some favorable opinions are expressed. — G. E. Partridge.

The Securing of Proper Medical Service for Injured Persons. *John W. Trask.* Mod. Med., Dec., 1919, 1, No. 8, 675–678. — "The question of satisfactory medical care for injury cases seems to resolve itself into ascertaining who are competent, well-trained surgeons, with the necessary temperamental qualifications, and where they are located, and then placing the injury cases under their care. The experience of the United States Employees' Compensation Commission has been that the whole problem depends upon the selection of properly qualified surgeons who will conscientiously do whatever is possible toward the physical restoration of their patient. This secures the maximum benefit to the injured at a minimum of cost to the government." — A. B. Emmons.

Compensation for Industrial Diseases. Labour Gaz., March, 1920, 20, No. 3, 304–310. — A discussion of the workmen's compensation acts of Great Britain, Canada, United States, and France, with special reference to the relations between accident and disease which the judicial courts and labor commissions have written into the law as a result of their interpretation of these acts. — L. A. Shaw.

REHABILITATION OF DISABLED EMPLOYEES

ROGERS AMENDMENT OF THE VOCATIONAL REHABILITATION ACT. Educational Record, Jan., 1920, 1, No. 1, 25. — This bill (H. R. 10875) provides for the vocational rehabilitation of any who have suffered a 10 per cent. loss of earning capacity through disability incurred in military service or traceable to military service. — G. E. Partridge.

THE FUNCTION OF PSYCHOLOGY IN THE REHABILITATION OF DISABLED SOLDIERS. *B. T. Baldwin.* Psychological Bull., Aug., 1919, 16, No. 8, 267–290. — There is a need of broad study of individual cases, including investigation of social, educational, and vocational experience, examination to determine skill of various kinds, tests for mental abnormalities, measurement of voluntary movement and muscular strength. From a curative standpoint, there is a wide range and a promising field for the application of psychological data. This study of the individual must be supplemented by an analysis of the movements of occupations considered with reference to their therapeutic uses. Attention must be given also to the development of a normal mental attitude on the part of disabled men. A sketch of some of the work done with the disabled is given. — G. E. Partridge.

VOCATIONS FOR MAIMED FIGHTERS. *St. Nihal Singh.* The Southern Workman, March, 1920, 49, No. 3, 113–120. — The article describes the work done at Roehampton, England, where in some cases men who had been total failures before the war, because of having failed to find suitable occupation, have improved their situation even though disabled. At this institute disabled men have applied for facilities for training in eighty-seven occupations. A list is given of occupations that have been found suitable for men who have lost one leg — occupations such as automobile driving, boot-repairing, metal turning and fitting, commercial work, work as automobile mechanics, electric work, razor-making, light leather work, photography, tailoring, toy-making, etc. The prospects of a man who has lost both legs depend largely upon the point at which the legs have been amputated. Many men who have lost both legs below the knee are holding their own in the industrial world. For men who have suffered amputation of both legs above the knee such occupations as light leather work, basket-work, boot-repairing, tailoring and fancy work have been selected. The positions in the industrial field that can be filled by men having but one arm are limited, but work has readily been found for them as clerks, labor-masters, porters, timekeepers, commercial travelers, watchmen, etc. The man who has lost one arm has more chance if he returns to his old trade or profession — if he has a suitable artificial appliance. In general the man with one arm can work up to about 70 per cent. efficiency in such a trade as wood-working. Over sixty occupations are regarded as available for men who have lost an arm. Even the case of the man who has lost both arms is not hopeless, especially if he has the use of one arm below the elbow joint. — G. E. Partridge.

RECONSTRUCTION OF AMERICAN DEAFENED SOLDIERS. *A. C. Manning.* Am. Annals of the Deaf, Jan., 1920, 65, No. 1, 74–85. — This is an interesting account of educational work done for the comparatively few men returned from military service with defects of hearing. The effectiveness of system in dealing with difficult problems of reconstruction and re-education is well shown. The article especially emphasizes possibilities in education in speech-reading. — G. E. Partridge.

REHABILITATION IN ITS RELATION TO THE PHYSICIAN. *A. C. Burnham.* Mod. Med., Feb., 1920, 2, No. 2, 93–95. — This brief article gives a description of the machinery devised for the purpose of taking care of those members of the U. S. forces who require rehabilitation. — L. Greenburg.

ABSTRACT OF THE LITERATURE

OF

INDUSTRIAL HYGIENE

VOLUME II SEPTEMBER, 1920 NUMBER 5

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GENERAL

HUMAN ENGINEERING — A NEW MEDICAL SPECIALTY. *Frank Leslie Rector.* Mod. Med., Feb., 1920, 2, No. 2, 133–136. — The author suggests that the term "industrial medicine" be replaced by "human engineering," a name which, in his opinion, defines more clearly the scope and possibilities of what the work offers. The field of activity of the human engineer borders on the following four industrial departments: employment, safety, medical, and welfare, in the making of physical examinations, the follow-up of accidents, the treatment of injured, and the supervision of the home life of the worker. — L. Greenburg.

INDUSTRIAL MEDICINE IN AMERICA AND HERE. Editorial. Lancet, Dec. 27, 1919, 197, No. 5026, 1199–1200. — This editorial reviews the discussion of the position of the physician and surgeon in the industrial era, which was held in the Clinical Congress of the American College of Surgeons. Application to England is here made of what Dr. Geier pointed out to be true of America, namely, that the medical profession must awake from its social torpor, since labor in seeking compensation for loss of time and wages is ahead of the profession of medicine, with the result that workmen's compensation laws are all promoted without seeking the guidance of those best fitted to inspire and direct such undertakings. The profession must acquire a greater appreciation of the loss to workers in time and wages and to the community in their productivity. The editor agrees with Dr. Geier that henceforth the medical profession "must be familiar with all the factors which affect the health of the employee from sanitation of the factory to the workingman's home, his food and his habits, with occupational diseases, with the factors of fatigue, and long working hours."

Dr. Moorhead considered the problem largely one of education and of preparing the medical student of the future on better lines. Although organizations for industrial health and welfare work have been developed in England, they

have little or no help from the medical profession. The question arises, therefore, as to whether the great field of industrial preventive medicine is to be left to lay organization entirely. Medicine and the public must work in unison if the national health is to be preserved and improved; otherwise much will be done incorrectly, which it will be difficult to undo. — J. C. Aub.

Industrial Hygiene. *J. W. S. McCullough.* Pub. Health Jour., June, 1920, 11, No. 6, 245–256. — This is a reprint of a paper read at the Annual Meeting of the Ontario Safety League at Toronto in April, 1920. The following aspects of industrial hygiene are very briefly touched upon: employment of minors and women; factory inspection; preventable accidents; poisoning from lead, phosphorus, arsenic, mercury, carbon monoxide; dusty trades; textile work; wood dust; coal mining; effects of heat; infections; tuberculosis; physical examination; and the need of a division of industrial hygiene as part of the public health department of every country. — R. M. Hutton.

Uses of Motion Pictures in Industrial Medicine. *Leslie W. Sprague.* Mod. Med., Sept., 1919, 1, No. 5, 396–398. — A statement of the character and utility of certain motion pictures in campaigns for industrial health. — C. K. Drinker.

Value of Plant Records in the Development of Plant Hygiene. *A. R. Hackett.* Am. Jour. Pub. Health, June, 1920, 10, No. 6, 525–527. — In a large number of the states the so-called occupational diseases are being put on the same basis as industrial accidents. A large number of conditions and diseases may be traced to poor plant hygiene while an even larger number can be traced to personal hygiene. In order to show that plant hygiene is or is not responsible for these conditions it is absolutely necessary that accurate records be kept and sufficient clinical and laboratory findings tabulated to show beyond a doubt what is the correct diagnosis.

All hygienic supervision of the plant should originate in the medical director's office and the value of it all depends on the records he keeps and the thoroughness with which they are worked out. In too many instances the medical director is called upon to do so much detail work that records are too brief and many important vital facts are overlooked.

The author states the necessity of a competent medical staff with plenty of full-time clerical help and a thoroughly modern laboratory and X-ray equipment with trained technicians in charge. This is an expensive proposition beyond the reach of the average small plant, but can be adequately met by the combining of several institutions in a given community to support a thoroughly equipped diagnostic clinic. — H. F. Smyth.

Self-Imposed Inspection of the National Canners' Association. *H. M. Loomis.* Am. Jour. Pub. Health, June, 1920, 10, No. 6, 521–525. — This article gives an outline of the inspection service instituted by the National Canners' Association which includes supervision of the raw materials, processes and products, of the factories and utensils and of the habits and dress of the employees. There are in all about thirty general sanitary requirements. It is estimated that at least one-third of the 1919 output of canned goods in the United States was subject to this inspection. Certificates are issued where standard conditions are met with. Many canners have admitted that the spirit of competition or emulation stimulated among their employees by this inspection has been of great benefit to them. — H. F. Smyth.

Air Medical Service. Air Service Information Circular, March 15, 1920, 1, No. 3, pp. 115. — This is a collection of articles which have been printed and of preliminary reports upon work now in progress by the Medical Division of the Air Service. In all cases the problems concern selection of the best physical and mental types for aviation, and their treatment is invariably highly technical in nature and of such limited use outside of aviation problems as to fail to necessitate detailed review. — C. K. Drinker.

The Training of Industrial Physicians. *J. A. Watkins.* Jour. Am. Med. Assn., June 12, 1920, 74, No. 24, 1643–1645. — "Thirty-one medical colleges or universities offer training facilities or instruction in industrial medicine or related subjects. Of these there are two schools offering courses in this subject, leading to certification on satisfactory completion; ten schools offer a limited amount of work in the curriculums leading to the degree of Doctor of Medicine; four universities offer some instruc-

tion in vocational hygiene during the course leading to one of four degrees in public health, the requirements of which are not standardized, while fifteen schools offering postgraduate public health instruction include limited instruction in industrial medicine or related subjects."

Following this statement of the meagre facilities now available for the training of industrial physicians, Watkins gives a very general sketch of the preparation they should obtain. He concludes that the industrial physician should have: "a sound medical education; ample practical experience in medical relief; a well-rounded knowledge of preventive medicine; a thorough knowledge of vocational hygiene; an understanding of our present day social problems, and be able in the light of this knowledge to apply intensively to groups and in a practical manner the best that the medical profession has to offer to society." — C. K. Drinker.

THE FUNCTION OF PART-TIME CONTINUATION SCHOOLS. *T. W. Gosling.* School and Society, May 15, 1920, 11, No. 281, 571–575. — This type of school is a concession to unfortunate social conditions which make early employment necessary, or to the restlessness of certain kinds of children who find the routine of the full-time school repugnant to their tastes. The continuation school for children under eighteen should be regarded as a merely temporary expedient. The fault lies partly with the child, partly with the school, but the industrial organization has been far too eager to absorb the cheap labor made possible by our undemocratic educational practices. There can be no equality of opportunity, when thousands of our boys and girls are either induced or permitted to enter industry before they are old enough to realize the handicaps they are imposing upon themselves by the curtailment of their educational opportunities. If there is heavy, hard and dirty work to do, work which men avoid if they can, true democracy will not seek merely to assure itself of a continuous supply of the labor by which this work may be performed, but rather will it endeavor, through the application of educated brains, to find means whereby the necessity for this kind of labor may be avoided. The best agencies which democracy has as yet devised are its full-time public schools. The continuation school helps to perpetuate class distinctions; it will best serve democracy by fitting its students for the two vocations, the only two which are well-nigh universal — the vocation of citizenship and the vocation of home-making. Universal and compulsory high-school education should be the goal for all except defectives. — G. E. Partridge.

SHOP INDUSTRIAL TRAINING. Nat. Civic Federation Rev., May 10, 1920, 5, No. 3, 3–4. — This is a report of the discussion held at the annual meeting of the National Civic Federation in regard to the relation of the reduction of the high cost of living to maximum production. Contentment in employment, it is believed, would help to supply the world's necessaries. — G. E. Partridge.

INDUSTRIES TAUGHT IN AMERICAN SCHOOLS FOR THE DEAF. Am. Annals of the Deaf, Jan., 1920, 65, No. 1, 1–22. — A useful list of various industries taught to the deaf, and a tabular statement of schools for the deaf, methods of instruction, industries taught, and other data. — G. E. Partridge.

UNIVERSITY PROFESSIONAL TRAINING COURSES IN PHYSICAL EDUCATION. *C. W. Hetherington.* Am. Physical Education Rev., May, 1920, 25, No. 5, 185–197. — There is in the United States a vast amount of physical unfitness in the most vigorous years, 90 per cent. of which is due to lack of physical education. But the situation is improving. California and twelve other states have recently passed laws requiring physical education in the public schools, and there is a bill in Congress aiming to do for physical education what the Smith–Hughes bill has done for agricultural education. At the present time there is an enormously increased demand for physical educators, and to meet this need the universities must provide the proper training. The writer attempts to outline in detail the proper function of the university and of the physical educator. The article contains a list and description of the play fields, courts and apparatus needed to carry out the California state program of physical education. — G. E. Partridge.

PROBLEMS OF PHYSICAL EDUCATION. II. *D. Snedden.* School and Society, May 15, 1920, 11, No. 281, 575–582. — The conditions of our modern life are highly unnatural, therefore physical training must be special. It must intelligently seek to give preparation, not for life in general, or life as it might have been for

rural or manual working peoples, but for modern needs. We should foresee the conditions and strains which are likely to be encountered, and prepare for them. At present, there is too much of the competitive spirit of a wrong kind in physical training. The adolescent tries, instinctively, to reproduce in himself the ancestral activities; he would fit himself for war, as it were, although, in the great number of cases, he will lead a sedentary life. We tend now, unfortunately, toward a kind of aristocracy in play; the highly cultivated and technically conducted games attract the few. Physical training is extravagant. On the contrary, play ought to be simplified. Leaders in physical education ought to get together to study the minimum essentials of physical development and training, as these might be provided for thousands of boys from ten to eighteen years old. It is surely time for physical educators to study the "simple life." We have too many gymnasiums, relatively speaking, and too little natural and outdoor life. — G. E. Partridge.

Problems of Physical Education. III. *D. Snedden.* School and Society, May 22, 1920, 11, No. 282, 601–606. — Are there essential factors in the physical life that can be produced only by work as contrasted with play? Play and work are very different, certainly in moral effect, and probably in physical. It is probable that substantial amounts of physical work, no less than of physical play, are essential to sound development. "To the writer it seems very probable that a wiser generation, some decades hence, will look back with amazement on such institutions as our summer camps, where adolescent youth, with almost superabundant energy is permitted and expected to spend sixty or ninety summer days in endless varieties of play at a time when what they need most (probably) for the final shaping of body and character is a daily measure of the physical toil which enlarges and hardens many large muscles and promotes the steady, measured action, against persistent resistance, of heart and lungs and stomach, and thus lays best foundations for prolonged bodily well-being." . . . The important work at present is to discover the facts. — G. E. Partridge.

The Position of the Medical Profession in Relation to National Physical Education. *K. Digby Bell.* Lancet, Jan. 31, 1920, 198, No. 5031, 231–235. — In this address, delivered before the Royal Society of Medicine on Jan. 21, 1920, Dr. Bell outlines the scheme of physical education used in training officers under instruction at the R. N. School of Physical and Recreational Training. He discusses at length the three main headings into which physical education is divided according to this system: namely, (a) activity developed by physical training; (b) energy developed by recreational training; (c) character developed by morale training. A chart is included which depicts a system of physical training which, if not ideal, at least treats the subject in its proper sphere of importance and magnitude, and forms a basis for thought and future development.

Dr. Bell gives three great reasons why, in his opinion, Great Britain found herself a C3 race during the critical days of the war: "(1) We have allowed the spirit of competition to concentrate on the training of a few specialists in one or other of our national sports, to the detriment of the mass of less fortunate citizens. . . . (2) The fact that the subject of physical education has not been taken up seriously by the nation, but has been left to private enterprise and so-called experts in various methods. . . . (3) The most important reason for our physical deficiency, in my opinion, is the fact that the subject has not been studied sufficiently by doctors. Our medical schools teach anatomy and physiology more with the ultimate object of curing disease than of preventing it." He concludes by saying, "The country urgently needs a more comprehensive and a better organized system of physical education, and, gentlemen, it is up to our profession to see that it gets it." — M. C. Shorley.

Monthly Record of Current Educational Publications. Department of the Interior, Jan., Feb., April, 1920. — These bulletins contain references to books and articles on vocational guidance, physical education, manual and vocational training, and other topics of interest to the student of hygiene. — G. E. Partridge.

A National Institute of Industrial Psychology and Physiology. U. S. Pub. Health Ser., Pub. Health Rep., May 7, 1920, 35, No. 19 1097–1098. — It has been proposed to establish in London an institution called the National Institute of Psychology and Physiology, which will investigate the human problems of industry and commerce. — L. A. Shaw.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

CIRCULATORY SYSTEM

Recent Statistics of Heart Disease. With Special Reference to Its Increasing Incidence. *Frederick L. Hoffman.* Jour. Am. Med. Assn., May 15, 1920, 74, No. 20, 1364–1371. — This paper presents a general discussion upon the importance of cardiac disease and the difficulty of considering cardiac conditions from a statistical point of view owing to the lack of any large body of knowledge upon the earliest phases of cardiac impairment. A further cause for error in the consideration of mortality data is found in the failure properly to record other causes of death in individuals who have been known to have heart lesions. Hoffman presents the following conclusions:

"I may say that of 8,408 deaths of males, 1,811, or 21.5 per cent., were complicated by diseases of the heart and by specific impairments; 531 cases were complications of valvular disease; 347 cases, of endocarditis; 339 cases, of myocarditis; 215 cases, of organic diseases of the heart not otherwise specified, and 169 cases, of cardiac asthma and dilatation, etc. In the same experience there were 390 deaths from Bright's disease complicated by arterial diseases, principally cerebral apoplexy, from which there were 307 deaths; and arteriosclerosis, from which there were seventy-three deaths.

"The foregoing statement must be sufficient for the present purpose to emphasize the extreme importance of a complete collateral analysis of all the causes of death in any discussion of heart impairments, with particular reference to the question of a possible increase in the observed degree of relative frequency. To those who wish to pursue this question further, it may be suggested that the statistics of the Roosevelt Hospital are of particular value in this connection in that they are available for a period of more than twenty years, and so stated as to emphasize the relative importance of complications, or collateral impairments, as the case may be." — C. K. Drinker.

Heart Disease as a Public Health Problem. *Lewis A. Conner.* Jour. Am. Med. Assn., June 5, 1920, 74, No. 23, 1564–1566. — A plea for recognition of the significance of cardiac disease as a problem in preventive medicine and for the utilization and further development of recognized agencies for the treatment of early cases. — C. K. Drinker.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

Anilin Poisoning — Its Diagnosis and Treatment. *R. P. Albaugh.* Mod. Med., Sept., 1919, 1, No. 5, 398–399. — A very brief statement upon anilin. The treatment advocated, after removal of the patient from actual contact with the poison, oxygen artificial respiration, camphorated oil — as a heart stimulant — with care to avoid alcohol for this purpose, would seem singularly inadequate. — C. K. Drinker.

Hygienic Control of the Aniline Dye Industry in Europe. *Charles Baskerville.* Abstracted from Jour. Indust. and Engin. Chem., 1920, 12, 393, by E. J. C. in Chem. Abstr., May 10, 1920, 14, No. 9, 1442. — "An abstract of a report under the above title for the U. S. Dept. of Labor by Dr. Alice Hamilton and a brief discussion of the situation in this country. The need is pointed out for an Institute for Industrial Hygiene in the U. S." — W. O. Fenn.

Bromethyl Poisoning With Fatal Termination. *Edgar Goldschmid* and *Elisabet Kuhn.* Zentralbl. f. Gewerbehyg., Feb., 1920, 8, No. 2, 28–36. — After a brief survey of the cases and symptoms of bromethyl poisoning in the earlier literature, the authors describe in detail nine cases which occurred as a result of the explosion of a kettle of bromethyl and a subsequent defect in the connecting pipe.

In three cases death occurred with practically identical symptoms. After a short feeling of illness, epileptiform, clonic-tonic convulsions appeared, with loss of consciousness and disturbance of respiration which led in a few hours to death.

The other six cases complained unanimously of dizziness, headache, general debility and dis-

turbance of equilibrium. In contrast with earlier findings, there was no case of diplopia or other interference with vision; only one patient, after three weeks, testified to a periodical dimness of sight. Likewise nausea and vomiting, which all earlier writers have recorded, appeared only in one case, after a week. Only one had clonic-tonic convulsions which were limited to four separate attacks starting in the right hand. Two cases showed conditions of psychic excitability — delirium, hallucinations, and somnolence. In all cases there were normal blood findings, no methemoglobin, and frequently biliary pigments in the urine. Investigation of the nervous system gave practically uniform results: absence of conjunctival and pharyngeal reflexes; positive Romberg; otherwise normal findings. The men all appeared stupid, and as if consciousness were maintained with difficulty. In the course of treatment they evinced a depressed, melancholy disposition which continued for a long time. Examination over seven months later showed them all capable of work, but apparently nervous; Romberg still faintly positive; trembling of hands and outstretched tongue; conjunctival and pharyngeal reflexes still faintly positive; but other reflexes normal.

Postmortem examination of the three who died showed excessive changes of the cortex of the brain in all cases; in the one completely sectioned case, acute inflammation of the respiratory tract in the form of purulent bronchitis, and inflammatory edema of the lungs. — M. D. Ring.

Nitrobenzene Poisoning With Cyanosis. Report of Case. *Frank G. Sanders.* Jour. Am. Med. Assn., May 29, 1920, 74, No. 22, 1518–1519. — "On the evening of Feb. 7, 1920, at about 6.30, a well dressed young man was brought into the Johnson and Beall Hospital. He was a railroad employee and had been in excellent health until the present afternoon. He had spent the afternoon at the theater and had gone to the interurban station to take the 6 o'clock car. The last thing he remembered was looking at his watch and noting that it was 3 minutes to 6. The person who brought him in stated that he had driven up to the mail box about 6 o'clock and had found the patient leaning over the package box apparently unconscious. He had brought the man directly to the hospital.

"The patient was of good physique. He was conscious, but seemed confused, and said that he was dizzy and that his chest was full of something. He was markedly cyanosed and gave the appearance of being intoxicated. The skin was cool and moist, the temperature normal. The heart and lungs were negative, as was the abdomen. During the examination a very decided odor of nitrobenzene became apparent, and this odor was traced to his shoes. Further questioning revealed the fact that the patient had had his shoes dyed immediately before going to the theater, and that he had sat in that poorly ventilated place all the afternoon breathing the fumes from his shoes. The shoes were very tight also, and direct absorption might have been a factor. The patient denied having a drink of any kind or any unusual food.

"The man's shoes were removed and he was placed by the open window. Within an hour he was able to go home, with some assistance. He was advised to keep his shoes away from him and to stay by the open window. By the evening of the next day, his cyanosis had disappeared along with the subjective symptoms, and the patient was able to return to his work apparently none the worse for his experience." — C. K. Drinker.

Physiological Action of Nitrobenzene Vapor on Animals. *Wallace L. Chandler.* Abstracted from Cornell Univ. Agr. Expt. Sta., Memoir, 1919, 20, 407–472 by J. S. Hepburn in Chem. Abstr., May 10, 1920, 14, No. 9, 1386. — "Expts. were made on dogs, rabbits, guinea pigs, gray rats, white rats, cats, hens, pigeons and certain parasites. Conclusions: Apart from a possible disturbance of the digestive functions and a possible asphyxia due to direct action on the blood, most of the symptoms of poisoning by nitrobenzene may be explained on the basis of disturbances in the cerebellum or cerebellar paths. Inhalation of the vapor of nitrobenzene in toxic doses produces chromatolytic degeneration of the Purkinje cells of the cerebellum. Histological examns. have shown only this degeneration and morphological changes in the erythrocytes. The blood may contain methemoglobin. The size of the lethal dose depends on certain conditions such as the amt. and kinds of fat in the blood; these conditions govern the concn. of the nitrobenzene in the vicinity of the nerve cells. A latent period elapses between administration of nitrobenzene and the onset of the symptoms of poisoning; during this period the nitrobenzene

is first absorbed from the blood and retained by the liquid fats of the body; then as its concn. in the blood lipins decreases with respect to its concn. in the body fats, it again passes into the blood; finally its concn. in the lipins of the cerebellar or other brain cells becomes sufficiently great to produce the onset of motor symptoms. The duration of the latent period depends in part on the same factors as control the size of the lethal dose, and in part on the condition of the brain lipoids. Nitrobenzene cannot be used with any degree of safety for fumigation of animals to destroy their external parasites; it should not be used as a flavor, as a perfume, or as a solvent in such prepns. as shoe polish or floor wax, and should receive serious consideration as an industrial poison in dye works, etc. A bibliography of 27 references is given." — W. O. Fenn.

DINITROBENZOL AND THE OPTIC NERVE. *R. Cords.* Zentralbl. f. Gewerbehyg., Jan., 1919, 7, No. 1, 6–11. — The general symptoms of poisoning with aromatic nitro-compounds, especially dinitrobenzol, have been known since 1901. The author's experience has been with a great number of cases showing disturbance of the optic nerve as a result of exposure to the poison in the munitions factories of the Rheinland. He classes these in four groups ranging from light, temporary disturbances to the most severe progressive disorders. In the first group the cases coming under observation are rare because usually the symptoms are too transitory to be reported. In those cited there was in general a slight lowering of visual acuity, from one-half to one-third with no central prolapse of visual field for color points. Occasionally there was a slight veiling of the papillary boundaries and a somewhat increased filling of the veins. In the second group the author placed cases of greater veiling of papillary boundaries with hyperemic discoloration and a striking dilation of the veins, together with a considerable lowering of central vision from one-tenth to one-fiftieth, and a relative central scotoma for red and green. The cases in the third group were most numerous. Here were found more or less pronounced processes of papillitis which later produced a temporal paling of the spot of the optic disk. In all of these there was an advanced central scotoma whereby frequently the red-green vision, and frequently the whole color sense was lost. There was often a difference of pupil, pronounced contraction and a noticeable inactivity toward light and convergence. The fourth group is the rarest. The author cites only one case in which progressive changes took place leaving the papilla entirely white, and a large absolute scotoma with the field of vision greatly narrowed.

In reviewing the factors which apparently increase susceptibility to this poisoning, Cords states that old age, poor nutrition, and excessive use of alcohol or tobacco were all effective. The cause of the phenomenon seems most reasonably explained as chronic disturbance of the nutrition of the optic nerve which is furnished with a blood supply poor in oxygen and highly thickened.

On the ground of these investigations, the author advises that there be strict enforcement of regulations, excluding from industries using nitrated hydrocarbons of the aromatic series those who are especially disposed to visual disorders on account of active earlier poisons (alcohol, tobacco, lead, carbon bisulphide, anilin, lues, and diabetes). Moreover, the admission of women, especially during the menstrual period and pregnancy, is inadvisable.

The results of poisoning are so serious that frequently the capacity for reading newspaper print and writing is lost. Workers themselves are apt to neglect the symptoms, partly because they consider them transitory, and partly because they do not wish to lose the high advantage accruing to them from the hazards of the industry. — M. D. Ring.

THE MERCURY-FREE DRESSING PROCESS DEVISED BY DR. KARL KURZBREMEN AND THE QUESTION OF SUPPLANTING MERCURY IN THE PELT DRESSING INDUSTRY. *Fr. Bortfeldt.* Zentralbl. f. Gewerbehyg., April, 1919, 7, No. 4, 53–57. — The author gives an account of the early history of making felt hats by hand, together with his theory of the action of the two constituents in dressing mixtures, mercury and nitric acid. Two of these mixtures are in common use, one containing more mercury than the other. The solution containing the smaller amount of mercury acts more quickly and produces a yellower felt, whereas the solution richer in mercury always gives a product more leathery in texture and of greater toughness. The function of the nitric acid is apparently to dissolve the outer rind of the hair, while the mercury serves to protect this from too rapid action.

Doctor Kurz found that tannic acid could be satisfactorily substituted for mercury in this process. Sumach solution and nitric acid were mixed and kept cold and in this condition were brushed upon the fur, which was then placed in the drying room at a temperature of 55° R. The author has used this method personally and has made hats of the fur of both rabbits and hares by the process, with entirely satisfactory results.

Since mercury can be thus dispensed with in the making of felt, the question arises whether or not its use should be forbidden. The author realizes that it is difficult for a manufacturer to change his plant over for the utilization of new raw materials. The quality of the product is likewise somewhat changed. New industries will, however, find in the above substitution financial advantage and possibly greater safety to employees. On the other hand, the process of felt making is difficult enough not to warrant any new procedure which is likely to make it harder. — M. D. Ring.

DUST HAZARDS AND THEIR EFFECTS

Dust Removal in the Transvaal Mines. *Junghans.* Zentralbl. f. Gewerbehygiene, Jan., 1920, 8, No. 1, 14–20. — The author emphasizes the fact that removal of dust and of gases, and provision for sufficient renewal of air both with reference to quantity and to temperature must be considered from a single viewpoint and treated as a whole. Air alone used for ventilation stirs up clouds of dust, whereas water alone used for settling the dust interferes with natural ventilation and reduces the renewal of air a fourth or a third.

Two suggestions are made whereby water and compressed air can be used together; one a process in which water by means of high pressure is flung against a solid wall and thus divided into fine streams, and the other, the direct spraying of water by compressed air. The latter is to be preferred since in this way the size of the water particles can be controlled and the stream direction regulated. The size of water particles is of greatest significance in the removal of dust and gases: large drops have little value, falling quickly without action; on the other hand, the water can be too finely divided, producing a mist which only darkens the air indefinitely. The author reports results of experiments carried out in an effort to estimate the most advantageous division of the water stream. The spray was so arranged that by means of an adjustable diaphragm the quantity of water and air could be regulated. Air pressure of about 30 kg. was used, and the air consumption accordingly amounted to about 2300 l. per minute. The nozzle openings were 3.2 mm., 0.8 mm., and 0.4 mm. in the different experiments. With the 3.2 mm. opening 95.26 per cent. of the fine dust was removed. The water vapor present in the air at a distance of 10 m. was 2.96 gm. per cubic meter. A drizzling rain could be felt at a distance of 30 m. With a 0.8 mm. nozzle, 77.5 per cent. of the fine dust was removed. The water vapor at a distance of 10 m. amounted to 4.38 gm. per cubic meter of air. The water particles were so small that they appeared like a mist. With an opening of 0.4 mm. a thick mist was produced even at a distance of 30 m. The air was saturated with water vapor, containing 4.76 gm. per cubic meter at a distance of 10 m. The mist persisted forty minutes after the spraying apparatus was shut off. In this case 54.0 per cent. of the fine dust was removed. Thus, 3.2 mm. is the best size of opening for the water spray for removing dust.

Since carbon monoxide is only slightly soluble in water, it is not removed by this method, so intensive ventilation is necessary in addition to the spray. This direct ventilation is best obtained by a combination of systems: i. e., blowing in fresh air under pressure and at the same time removing the used air with suction pipes.

The author states the necessity of direct sprinkling of large piles of rocks and the need of making especial provisions before blasting.

By the use of these methods the Transvaal mines, formerly hazardous because of their dust, have reduced the death rate from tuberculosis a fifth. There are now no gold mines in this region which are unprovided with the necessary equipment of these water sprays. — M. D. Ring.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

ANTHRAX: COMPARISON OF SURGICAL AND NONSURGICAL METHODS OF TREATMENT: A REVIEW OF FIFTY-ONE CASES TREATED AT THE MASSACHUSETTS GENERAL HOSPITAL FROM 1888 TO 1918. *Albert J. Scholl.* Jour. Am. Med. Assn., May 22, 1920, 74, No. 21, 1441–1444. — "The majority of the methods of treating anthrax described in the literature are conservative. Surgical intervention offers very little. The organism is building up protective barriers and walling off and splinting the infected area. The main contention of those advising surgery is that the lesion is strictly a local one, and excision should be performed before generalization takes place. On the contrary, there is probably a systemic infection from the onset, but in most cases it is not so great that the organism cannot overcome it. The involvement of neighboring lymph glands which is seen in most cases, and the marked edema which, at times, extends as much as 25 cm. beyond the local lesion, argue against a localization of the infection. A wide excision through this edematous area, giving an extensive field for absorption, opening up many new portals of entry is sufficient, in some cases, to overcome completely the resistance of the patient."

The author concludes with the following summary:

"1. The early diagnosis is made bacteriologically by the demonstration of the anthrax bacilli in the wound. Anthrax bacilli were found in 81.2 per cent. of the cases treated at the Massachusetts General Hospital.

"2. The general symptoms give no constant indication of the severity of the infection.

"3. The mortality in the cases reviewed was 13.7 per cent.

"4. Four of nine patients (44 per cent.) treated surgically died; only three (7 per cent.) treated nonsurgically died.

"5. Forty-two patients had lesions on the face and neck. Cervical infections are especially dangerous; two of the patients treated nonsurgically died from respiratory difficulty resulting from the associated edema.

"6. The patients treated nonsurgically were confined to bed. Their lesions were left absolutely alone and exposed to the air; no special general measures were carried out.

"7. In several of the surgical cases a rapid increase in the edema, a steady decline in the patient's general condition, and death several hours later definitely pointed to the operation as the causative factor." — C. K. Drinker.

BRITISH PROVISION FOR TUBERCULOUS EX-SOLDIERS. U. S. Pub. Health Ser., Pub. Health Rep., April 30, 1920, 35, No. 18, 1043–1045. — A deputation representing the Interdepartmental Committee on Tuberculosis, the Papworth Tuberculosis Colony, and the Norfolk Branch of the British Red Cross Society, in a memorandum to the British Minister of Health, revealed the fact that tuberculous patients who return from a sanitorium to their homes and former occupations are unable permanently to earn a living or maintain their health. The same deputation makes recommendations for the adoption of a village settlement, a brief description of which will be found in this article. — L. A. Shaw.

THE MUNICIPAL WORKSHOP: A SCHEME FOR THE POST-SANATORIUM EMPLOYMENT OF THE CONSUMPTIVE EX-SOLDIER. *F. Stanley Tinker.* Lancet, Feb. 21, 1920, 198, No. 5034, 457–458. — It is universally admitted that the length of sanatorium treatment for the working-class population is unduly short and can only be expected to arrest the disease in a small percentage of very early cases. It is practically impossible, however, to induce the average town-dweller to stay for a more prolonged period, first, because he cannot understand the necessity of continuing treatment after he feels well, and second, because the needs of his dependents force him to return to care for them. The problem, therefore, has become one of improving methods of after-care, a scheme for which is contained in this article. It is suggested that work of a suitable kind be provided in special municipal workshops within easy access of the patients' homes, and under medical supervision. The workshops should be divided into two parts; one to provide training in suitable occupations, and the other a permanent workshop in which the training could be put into actual use. In both parts, the conditions and hours of work would be regulated by the medical officer in charge, who would see the men at stated intervals and assess the number of hours work a day. The work should consist of light manual employment in selected

trades, the correct selection of which is extremely difficult and of infinite importance, as upon it rests the success or failure of the scheme. A good mid-day meal should be provided so that no energy is lost by the men in going home. The shops would be open for eight hours a day, and five and a half days a week, but it would depend on the physical fitness of the worker how many hours he would be able to work.

The objects claimed for this scheme are as follows:

"1. Economy in the long run. Less initial outlay. Less frequency, and eventually almost total abolition of relapse, and the production of useful work by an otherwise idle population.

"2. Immediate relief. Some such scheme could be put into working order while the plans of colonies are still being prepared.

"3. An outlet for the men when their time of training under the Ministry scheme is complete instead of their being faced with the open market of competitive labour in the old unsuitable workshop.

"4. It will work in and not against any existing or proposed schemes. . . ." — M. C. Shorley.

International Standards of Public Health and Welfare Work. *William C. White.* Lancet, Oct. 25, 1919, 197, No. 5017, 719–720. — In this address delivered before the British National Association for the Prevention of Consumption, in London, October 16, 1919, Dr. White, Medical Director of the Tuberculosis League of Pittsburgh, proposes certain essentials of international standards, his object being to render effective the work of all organizations against tuberculosis — in other words, to fit the equipment to the task to be done. His suggestions are: first, a careful analysis of each region in order to find out exactly the specific task to be performed; second, the establishment of a building unit of public health nurse and her territory; and third, the correlation of these on the basis of adaptation to the region to be handled. To push these standards throughout the world will require constant modifications based upon a knowledge of language and of the origin and former condition of the people to be cared for. A step toward obtaining such knowledge has already been taken in the establishment of a number of international scholarships in public health nursing. — J. C. Aub.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

Safety Measures in the Production of Explosives. *R. Fischer.* Zentralbl. f. Gewerbehyg., March, 1919, 7, No. 3, 37–42. — The author gives forty-five rules with regard to instruction of workmen, regulation of wearing apparel (fire-proof garments, nailless shoes, etc.), inspection of buildings, precautions in heating and lighting, methods of storing and packing explosives, as means to prevent all possible sources of accident. — M. D. Ring.

Accidents and Accident Prevention in Machine Building. Revision of Bulletin 216. *Lucian W. Chaney.* U. S. Bur. Labor Statis., Bull. No. 256, Nov., 1919, pp. 123. — The investigation reported in this bulletin was undertaken not only to ascertain the frequency and severity of acidents in the machine-building industry but also to study and analyze these accidents in such a way as to supply the information necessary for effective safety work. Tables are given showing accident rates for 1912 by character of product, and by departments; course of accident rates over a series of years; frequency and severity of accidents among American and foreign-born workmen; and day and night accident distribution. Chapters follow on *Safety Organization*; *Direct Safeguarding Methods in Machine Building*; and *Machine Design as a Factor of Safety.* — M. C. Shorley.

Accidents at Metallurgical Works in the United States During the Calendar Year 1918. Compiled by *Albert H. Fay.* U. S. Bur. Mines, Tech. Paper 256, Jan., 1920, pp. 23. — The statistical tables in this report show the classification and the number of accidents at metallurgical works in the United States during 1918. — M. C. Shorley.

Metal-Mine Accidents in the United States During the Calendar Year 1918. (With supplemental labor and accident tables for the years 1911 to 1918, inclusive.) Compiled by *Albert H. Fay.* U. S. Bur. Mines, Tech. Paper 252, Jan., 1920, pp. 113. — In this statistical compilation, tables are given showing accidents by causes, states, industrial

groups, and mining methods for each of the five divisions of the mining industry as follows: copper mines; gold, silver, and miscellaneous metal mines; iron mines; lead and zinc mines (Mississippi Valley); and non-metallic mineral mines. — M. C. Shorley.

Accident Prevention in the Automobile Industry. *F. H. Moody.* Pub. Health Jour., June, 1920, 11, No. 6, 259–265. — This is a reprint of a paper read at the Annual Meeting of the Ontario Safety League at Toronto in April, 1920. The writer points out that while the value of safeguards when applied rationally cannot be overestimated, the full effectiveness of safety engineering is sometimes injured by the "super-enthusiast." "The subject must be approached rationally, never losing sight of the present day slogan 'Increased Production.'" After describing the protective devices in use at the works of the McLaughlin Motor Co., Ltd., Oshawa (a subsidiary of the General Motors Co. of Canada, Ltd.), the progress in safety education and the equipment for first aid, an account is given of a plan for central organization for the promotion of safety work throughout the various divisions of the General Motors Corporation. — R. M. Hutton.

INDUSTRIAL SURGERY

War Contributions to Industrial Surgery. *Stanley R. Maxeiner.* Mod. Med., March, 1920, 2, No. 3, 231–235.—The author describes certain lessons learned in war service which he feels may be applicable to industrial surgery.

"Blood transfusions prepared wounded soldiers for extensive surgical operations and saved thousands of lives. Every hospital should have a pathologist or technician available for grouping patients, and donors, already grouped, should always be accessible from among its employees. Blood should be transfused before, during, or after operations on patients suffering from severe shock.

"More attention and better care of the slightly injured are indicated.

"Débridement should be performed on contaminated wounds of industry the same as on war wounds. Primary, delayed primary, or secondary suture should be practised extensively in an attempt to shorten the period of disability in industrial injuries.

"Anti-tetanic serum should be used in all industrial cases with abrasions of the skin.

"Conversion should be made where possible, of compound fractures into simple fractures, following a débridement, the cases usually calling for delayed primary suture. Earlier passive motion and massage of contiguous joints in all fractures is advisable. General adoption of the Thomas outfit for the transportation of patients with fractures of the extremities is urged.

"The radiologist should indicate more careful localization of foreign bodies with indelible marks upon the skin before open operation for their removal.

"Routine closure of wounds of joints after thorough mechanical cleansing should be practised.

"Early incisions are called for in septic joints in conjunction with Dakin irrigations and passive motion.

"Ether and chloroform should be displaced by the safer and better methods of anociassociation or local anesthesia. Cushing advocated local anesthesia for all craniotomies; it is advocated by others for all operations on the chest and it certainly is called for in almost all minor operations.

"The employment of trained attendants for late treatment of cases with functional results below normal is recommended and the establishment of schools for the re-education of the industrial cripple.

"The war has taught many lessons and it would seem that their greatest field for usefulness is in industrial surgery, in which field they apply not only to the specialist but to every general practitioner who is occasionally called upon to treat such cases." — L. Greenburg.

The Treatment of Mutilated Fingers and Especially Thumbs by Autoplastic Operations and Transplantations. *C. Lenormant.* Presse méd., April 17, 1920, No. 23, 223. — Loss of the thumb is, of course, as serious as loss of all four of the other fingers. Hence plastic reconstructions are most often practiced for this digit. The simplest form is mobilization of the metacarpal, by section of the interossei (though carefully preserving the thenar muscles), and suture of the dorsal to the palmar cutaneous flaps. Digits constructed in such a way are better than none, and a child

can learn to write with one, but prehension is the only function which is retained, and the cosmetic result is bad. There are two methods of reconstruction from tissues at a distance which offer some hope of success: autoplastic reconstruction, and transplantation of another digit. In the autoplastic method, the stump of the lost digit is implanted into the skin of the abdomen or thigh, and when vascular connections are well established, a flap is cut from its original situation and formed into a finger. It may be left soft, or a graft of tibia or rib may be placed inside it at a tertiary operation; or the osseous graft may be planted beneath the proposed site of the cutaneous graft as a preliminary. Autoplastic transplants may be made from the toes or remaining fingers; they too are grafted in by the Italian method, and the tendons then sutured in. They are rather likely to sphacelate or to become obstructed by adhesions and bands. Those from the small toes are the least mutilating, but also the least useful. — T. J. Putnam.

A Study of Traumatic Hernia, So-Called, Among Railway Employees. *C. W. Hopkins.* Mod. Med., Sept., 1919, 1, No. 5, 389–393. — "Hernia results from a developmental defect and accidental injury can be only a secondary cause.

"So many unjust claims are allowed under present conditions that the law should take cognizance of the fact, and definitely settle the matter.

"The only protection possible at the present time is the routine examination of all employees for record for their physical condition at time of employment."

In the opinion of the author, hernia is especially frequent among foreigners and these men are particularly apt to force the company to "buy" an old hernia which far antedates their employment. "If rational interpretation in such cases is not made, workmen with this inherent weakness will have to be excluded from certain industries." The ruling of the Nevada Industrial Commission, Sept. 26, 1913, is cited as in accord without modern ideas upon this subject. — C. K. Drinker.

Relation of Orthopedic Surgery to Industrial Surgery. *Roland Hammond.* Jour. Am. Med. Assn., July 24, 1920, 75, No. 4, 213–214. — This paper, read before the Section on Orthopedic Surgery at the American Medical Association meeting, April, 1920, outlines the future position of the orthopedist in relation to industry, and makes a particular plea for surgical supervision of the injured during late convalescence and at the time of returning to work. — C. K. Drinker.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

First Annual Report of the Industrial Fatigue Research Board to 31st March, 1920. London, 1920, pp. 31. — A brief account of the organization and work of the English Industrial Fatigue Research Board, giving the personnel, plans for research and accomplishment of the organization. A list of the publications of this board is as follows:

No. 1. — The Influence of Hours of Work and of Ventilation on Output in Tinplate Manufacture, by H. M. Vernon, M.D. (*Price 6d. net.*)

(The fatigue and output of mill-men working on shifts of different length and in factories with different systems of ventilation are compared, the data being obtained partly from existing records and partly by direct observation.)

No. 2. — The Output of Women Workers in Relation to Hours of Work in Shell-Making, by Ethel E. Osborne, M.Sc. (*Price 6d. net.*)

(Embodies the result of a small investigation based on the booking of hourly output of 43 women engaged in shell-making during one week on two 12-hour shifts and during one week on three 8-hour shifts, and compares the fatigue and output under the two systems.)

No. 3. — A Study of Improved Methods in an Iron Foundry, by C. S. Myers, M.D., ScD., F.R.S. (*Price 2d. net.*)

(Describes the effect on fatigue and output of the methods adopted in a certain iron foundry in the Midlands.)

No. 4. — The Incidence of Industrial Accidents upon Individuals, with Special Reference to Multiple Accidents, by Major Greenwood and Hilda M. Woods. (*Price 6d. net.*)

(A statistical investigation of certain accident records kept by the Ministry of Munitions.)

No. 5. — Efficiency and Fatigue in the Iron and Steel Industry, by H. M. Vernon, M.D. (*In preparation.*)

(Based on an extensive investigation into the iron and steel industry through the country.)

No. 6. — The Speed of Adaptation to Altered Hours of Work, by H. M. Vernon, M.D. (*In preparation.*)

No. 7. — Individual Differences in the Cotton Industry, by S. Wyatt, M.Sc. (*Price 6d. net.*)

Copies of these reports can be purchased from H. M. Stationery Office, Imperial House, Kingsway, London, W. C. 2, England. — C. K. Drinker.

PREVENTION OF FATIGUE IN INDUSTRY —IV. PSYCHOLOGICAL TESTS AND THE REDUCTION OF NECESSARY FATIGUE. *Reynold A. Spaeth.* Indust. Management, April, 1920, 59, No. 4, 311–313. — Dr. Spaeth calls attention to the probability that the industrial misfit is the first to be affected by the pace in an intensive occupation. Although there is no immediate prospect of a scheme by which workers can be assigned to occupations with unerring precision, the use of trade and psychological tests has already proved of value in the army and in connection with certain types of civilian work. Psychological tests at present show the probability of the individual's succeeding in a certain line of work rather than locating him definitely outside of or within a certain field. But even this is a marked improvement on the commonly accepted haphazard methods of selection. "Success and satisfaction are likely to go hand-in-hand in an industrial job. If we can place our workers in jobs for which they are physically, physiologically, and psychologically fitted — the chances of cumulative fatigue will be reduced to a negligible minimum." — C. H. Paull.

PREVENTION OF FATIGUE IN INDUSTRY —V. CERTAIN LIMITATIONS OF SCIENTIFIC MANAGEMENT. *Reynold A. Spaeth.* Indust. Management, May, 1920, 59, No. 5, 409–411. — Dr. Spaeth calls attention to the danger of laying too much stress upon the purely mechanical phases of scientific management. While proper tools, adequate instructions, and time studies make valuable contributions to production, they are by no means the only factors involved. Too frequently the rate at which workers are expected to produce is considered quite apart from such elements as lighting, ventilation, and heating. Scientific management is not merely a problem for the engineer. If its achievements are to have permanent value they must also involve the experience of the psychologist, the physiologist, and the psychiatrist. Wherever the human element is involved, there is a task for the human engineer.

At present, time study methods lack standardization. It is suggested that a committee be appointed by the Society of Industrial Engineers, and that this committee include not only time study men but also representatives of the group of human engineers. Only when time studies are standardized upon the basis of the combined experience of the time study man and the physician and his associaties may we look for the elimination of fatigue as a dangerous factor in scientific management. — C. H. Paull.

A CARDIOVASCULAR RATING AS A MEASURE OF PHYSICAL FATIGUE AND EFFICIENCY. *Edward C. Schneider.* Jour. Am. Med. Assn., May 29, 1920, 74, No. 22, 1507–1510. — This need of a measure for physical efficiency whereby degrees of fatigue, physical fitness and health may be determined has been felt alike by the medical profession and instructors in physical education and school hygiene. Of late, the newly awakened interest in industrial efficiency has shown that we lack satisfactory and reliable tests of fatigue.

The most satisfactory test for fatigue and loss in physical fitness would be one that eliminates the "personal equation" of the examiner and the anxiety and dishonesty of the patient. Replies to questions concerning symptoms and habits are often misleading because of a preformed opinion by the examiner or because the patient is incapable of self-analysis and accurate description of his experiences. Furthermore, for personal reasons some men would prefer to mislead the examiner, and the test should not, therefore, demand much co-operation and attention from the patient.

Any regular physical training should produce certain functional changes in the body. The cardiovascular changes during altered physical fitness have been studied most, and it is these that are considered in this paper. The tests here discussed should not be confused with functional heart tests, since our concern is with cardiovascular changes only so far as they give evidence of fatigue and health changes in the body.

THE PULSE RATE AS A CRITERION OF HEALTH

(*a*) *The Postural Rates.* — Meylan concluded that a horizontal posture pulse rate between 40 and 50 and a vertical posture rate betweeu 50

and 90 were favorable health signs. Dawson found that training slowed the resting pulse rate as much as 9 beats per minute and this especially influenced the noon and afternoon pulse. He also found that acute infection caused an increase in the pulse rate, but this was much less pronounced in the trained than in the untrained man. In young men, the normal average pulse rate has been reported to be 78.9 standing, 70.1 sitting, and 66.6 lying.

(*b*) *Pulse Rate Increase on Standing.* — Vierordt found that on the average the pulse increase is from 12 to 14 beats between reclining and standing. Crampton reported that in vigorous subjects there was little change, while in wearied subjects there may be an increase of 44 beats per minute. It is now recognized that in states of debility the postural difference may be as much as 30 to 50 beats per minute. A slow horizontal and a slow vertical postural rate with a small difference between the two are usually signs of excellent health.

(*c*) *Exercise Pulse Rate.* — The increase in the pulse rate after a certain amount of work is greater in the untrained than in the trained person. Hartwell and Tweedy, comparing athletic and non-athletic women, found that running up and down stairs accelerated the heart rate an average of 10 beats more in the non-athletic women.

(*d*) *The Decline in Pulse Rate After Exertion.* — Flack and Bowdler, from a study of the reactions following stepping on a chair five times in fifteen seconds, conclude that the heart rate in the healthy subject should not increase more than 25 beats and should return to normal within thirty seconds. Meakins and Gunson report that after a climb of twenty-seven steps at a brisk walk, the pulse rate returned to normal within one minute in healthy subjects, while in patients it required as much as five minutes.

It should be emphasized that while the several pulse-rate criteria of fitness may all be found in a single person, not one or even any two of them is found to be an absolute test. In forming a judgment as to the physical condition of a man it is best to consider together the postural rates, the increase on standing and after exercise, and the time required for the rate to return to normal after exercise.

THE ARTERIAL BLOOD PRESSURE AS A CRITERION OF CONDITION

(*a*) *The Normal Arterial Pressures.* — While it has been held that training raises the systolic blood pressure, the best recent opinion is that during rest the blood pressure of the trained and untrained individual is the same.

(*b*) *Postural Changes in Arterial Pressures.* — In normal subjects the systolic pressure is 10 mm. higher in the standing than in the recumbent position. Sewall has shown that individuals in whom there is excessive gravitation of the blood to the limbs and splanchnic area on standing are victims of physical weakness and nervous instability and often suffer from headache, dizziness, or tinnitus in the erect posture. Crampton demonstrated that a subject might, when standing, show weakness by a decrease in the systolic pressure or by a large increase in the heart rate. Recently, Sewall has pointed out that a weakened patient on standing may fail to show the systolic drop, but instead may have an inordinate rise in diastolic pressure. He employs this rise in diastolic pressure and low levels of pulse pressure as measures of fitness.

These observations on pulse rate and blood pressure suggest thoroughly objective methods of measuring fatigue, staleness and weakness. Various efforts have been made to utilize them but all are subject to error. Schneider and his associates in their work with aviators have developed the following system of grading cardiovascular reactions.

POINT SYSTEM FOR GRADING CARDIOVASCULAR REACTIONS

"This scheme uses in part a plan proposed by Dr. J. H. McCurdy for rating infantry men in cardiovascular and neuromuscular efficiency. The scores for each of the six items range from +3 to −3. A perfect score, the sum of the value given to each of the six items, is 18. The values as assigned appear in Table 1, Parts A, B, C, D, E and F. In using the table for scoring, Parts A and B, also C and D, must always be used together. Thus, if an individual has a pulse rate increase of 15 beats (see Part B) on standing and his reclining rate was 60 (see Part A), he is graded 3 on his standing increase. However, if his reclining rate had been 100, then a standing increase of 15 would have been scored 0."

PROCEDURE IN MAKING OBSERVATIONS

"1. The patient reclines for five minutes. (*a*) The heart rate is then counted for twenty seconds. When two consecutive twenty second counts are the same, this is multiplied by 3 and recorded. The score is noted according to Part

A, Table 1. (*b*) The systolic blood pressure is next taken by auscultation; two or three readings are made as a check.

"2. (*a*) The patient stands at ease for one or two minutes to allow the pulse to assume a uniform rate. When two consecutive twenty sec-

TABLE 1. — POINTS FOR GRADING CARDIOVASCULAR CHANGES

A. Reclining Pulse Rate		B. Pulse Rate Increase on Standing				
Rate	Points	0–10 Beats, Points	11–18 Beats, Points	19–26 Beats, Points	27–34 Beats, Points	35–42 Beats, Points
50–60	3	3	3	2	1	0
61–70	3	3	2	1	0	−1
71–80	2	3	2	0	−1	−2
81–90	1	2	1	−1	−2	−3
91–100	0	1	0	−2	−3	−3
101–110	−1	0	−1	−3	−3	−3

C. Standing Pulse Rate		D. Pulse Rate Increase Immediately after Exercise				
Rate	Points	0–10 Beats, Points	11–20 Beats, Points	21–30, Beats, Points	31–40 Beats, Points	41–50 Beats, Points
60–70	3	3	3	2	1	0
71–80	3	3	2	1	0	0
81–90	2	3	2	1	0	−1
91–100	1	2	1	0	−1	−2
101–110	1	1	0	−1	−2	−3
111–120	0	1	−1	−2	−3	−3
121–130	0	0	−2	−3	−3	−3
131–140	−1	0	−3	−3	−3	−3

E. Return of Pulse Rate to Standing Normal after Exercise		F. Systolic Pressure, Standing Compared with Reclining	
Seconds	Points	Change in Mm.	Points
0–60	3	Rise of 8 or more	3
61–90	2	Rise of 2–7	2
91–120	1	No rise	1
After 120:		Fall of 2–5	0
2–10 beats above normal	0	Fall of 6 or more	−1
11–30 beats above normal	−1		

ond counts are the same, this is multiplied by 3 and recorded. The score is obtained by use of Part C, Table 1. The difference between the standing and reclining pulse rates is scored then by use of Part B, Table 1. (*b*) The standing systolic pressure is next taken. The difference between this and the reclining systolic pressure is then scored by Part F, Table 1.

"3. The patient next steps on a chair about 18 inches high, five times in fifteen seconds timed by a watch. To make this test uniform, he stands with one foot on the chair at the count one; this foot remains on the chair and is not brought to the floor again until after the count five. At each count he brings the other foot on the chair and at the count "down" replaces it on the floor. This should be timed accurately, so that at the fifteen second mark both feet are on the floor. (*a*) Immediately, while he stands at ease, the pulse rate is counted for fifteen seconds; this is multiplied by 4 and recorded. (*b*) Counting is continued in fifteen second intervals for two minutes, record being made of the counts at 60, 90 and 120 seconds.

"The data from *a* will be scored by Part D, Table 1, taking the difference between this exercise pulse rate and the standing rate. The data in *b* are scored according to Part E, Table 1.

"This system of scoring men as to physical fitness is now being used by flight surgeons in their work among aviators, and is applied at the Medical Research Laboratory at Mitchell Aviation Field on Long Island.

"That there may be value in assembling the circulatory data under such a point system is

TABLE 2. — EFFICIENCY SCORE IN FIFTY-FOUR CASES

Points	No. of Cases	Per Cent.
0 or less	2	3.7
From 1 to 3	9	16.6
4 to 6	15	27.8
7 to 9	22	40.7
10 to 12	3	5.6
13 to 15	3	5.6
16 to 18	0	0.0
Total	54	100.0

indicated from an analysis of fifty-four cases of aviators who, when examined by the medical officers of the departments of the laboratory, were found to be ailing and physically below standard. The medical examinations included an overhaul by the internist, neurologist, ophthalmologist, and ear, nose and throat expert. The medical findings include a large variety of conditions, the majority being common to any group of men and in no way characteristic of aviators.

"That which was of greatest interest in this analysis was the final efficiency score of each patient. The distribution of the cases is shown in Table 2.

"Only six of the fifty-four cases had a score of 10 or better, while 88.8 per cent. had scores ranging between 9 and −1. These figures seem to indicate that a score of 9 or less is characteristic of physically unfit men.

"On the assumption that a score of 9 or less gives indication that the clinician may find something wrong with the patient, we have listed all men among a group of 150 men who had a low score. In this group there were forty-six who scored 9 or less.

"The medical examiners working independently, and without the cardiovascular data available to them, recorded abnormal conditions in thirty of the forty-six men. Thus, when working independently, 65.2 per cent. of the group of forty-six with low scores by the cardiovascular efficiency test were found by others to be below standard. Two of the men were unfit because of excessive smoking, and one had recently been on a drunken spree. The neurologist reported five as stale and nervously unbalanced, the internist alone found five unfit, six were tonsil or local infection cases, and the remainder were found wrong by at least two of the medical departments.

"This point system of scoring men as to health and physical fitness by the cardiovascular reactions is easily applied. It has the advantage of stimulating men to attempt to improve the score by exercise and proper living. It is suggested that a score of 9 or less gives reason for an overhaul of the patient by a clinician. Aviators with a low score might well be called back for further examination and observation. A poor score suggests a search for a cause. The cause may be disease or unhygienic living." — C. K. Drinker.

WOMEN AND CHILDREN IN INDUSTRY

First Annual Report of the Director of the Woman in Industry Service for the Fiscal Year June 30, 1919. Woman in Industry Service, U. S. Dept. Labor, 1919, pp. 29. — Part I of this report, *Activities During the War, July 16 to November 11, 1918*, outlines the specific purposes and functions of the Woman in Industry Service, which was organized in July, 1918, presents the program proposed, and reports the action taken in each section of the program as follows: establishment of standards; recommendations relative to employment of women in hazardous occupations, night work, wages and industrial relations, and training.

The second part of the report on *Activities after the Signing of the Armistice* includes such questions as labor legislation, wages after the war, displacement of women workers, home work in Bridgeport, statistics of the employment of women, and the relation of women to the Peace Conference. A permanent status is urged for the Women's Bureau owing to the importance of the position of women in industry, and also an increase in resources to make possible more comprehensive work.

In the appendix, which concludes the report, there are set forth the standards recommended, among which are provisions in regard to hours of labor, wages, working conditions, home work, and employment management.—M. C. Shorley.

Special Provisions for the Health and Comfort of Women in Business. Nat. Assn. of Corporation Schools Bull., April, 1920, 7, No. 4, 157–159. — This is a report of data which have been collected relative to the special provisions made for the health and comfort of women in business. Among these are mentioned the following: the privilege to assemble later and leave earlier than the men workers; pensions at an earlier age and for shorter service; special women's service departments; the publication of special information booklets; the provision of medical service; day nurseries for the children of women employed; extra bathing facilities; and separate entrances. — G. E. Partridge.

Agricultural Education for Women in England. School and Society, July 31, 1920, 12, No. 292, 87–88. — "A meeting was held last month in London to establish the training of women as skilled agricultural workers on a national basis. . . . Never has the national need for scientific food production on the one hand, and for remunerative and healthy employment of educated women on the other been greater." It is proposed to extend the work of Swanley Horticultural College to meet the new requirements. — G. E. Partridge.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

CONTROL OF ATMOSPHERIC CONDITIONS IN HOT AND DEEP MINES. Report of a Commission. Tr. Institute Mining Engineers (England), April, 1920, 58, Part 4. — In those places where the heat is not so great as to prevent continuous work, it may nevertheless be impossible for men to work at their ordinary rate without an abnormal rise of body temperature, so that the amount of work which they actually do is so small as to be economically unproductive. With an absence of air currents in deep mines there is a need for adequate ventilation with underground temperature control. The most hindering effects depend upon the degree of stagnation of air and amount of moisture present (wet bulb temperature) rather than the temperature there alone. The article presents a most interesting scientific discussion. — R. H. Greenman.

DETECTION OF ORGANIC INHIBITING SUBSTANCES IN EXHALED AIR. *Gerhard Stroede.* Abstracted from Z. Schulgesundheitspflege, 30, No. 1; and Zentr. Biochem. Biophys., 1918, 19, 667, by H. S. Paine in Chem. Abstr., May 10, 1920, 14, No. 9, 1401. — "Using the Weichardt procedure with inorg. catalysts, S. investigated the presence of inhibiting substances in exhaled air, especially in school rooms. Colloidal Os was so affected by certain constituents of exhaled air that it suffered partial inhibition of its catalytic power of transferring O. The condition of the air in occupied buildings, rooms, etc., may be tested by this method. The above inhibition of the action of Os by exhaled air is produced to only a slight extent by the known chem. constituents of the latter. By taking absorption of CO into account in connection with this inhibition it can be shown with certainty that other inhibiting substances of unknown character are present in exhaled air." — W. O. Fenn.

THE ELIMINATION OF NOISES IN HEATING AND VENTILATING SYSTEMS. Heating and Ventilating Magazine, May, 1920, 17, No. 5. — In this, the first of a series of articles, the author points out that by careful designing and proper precautions many of the troubles found in heating and ventilating systems may be overcome. By the introduction of a vacuum system, doing without the valves, it is possible to eliminate the whistling of air. The nuisance of the water hammer is to be remedied by the prevention of condensation and by proper drainage. The water hammer sound is caused by steam rapidly condensing in contact with large quantities of water at a low temperature. The article makes other suggestions for the elimination of roaring in air ducts and resounding steam affected by engine pulsations, etc. — R. H. Greenman.

THE RURAL SUPPLY AN INTEGRAL PART OF THE MUNICIPAL SUPPLY. *E. G. Birge.* Canad. Engineer, May 20, 1920, 38, No. 21, 490–491. — This article tells an old story in a new way. The author points out the possibility of the spread of an epidemic, such as typhoid fever, from one contaminated well existing on an isolated farm so that it endangers the whole community. The remedies suggested include better follow-up work by the state department of health, extension of the work of the American Water Works Association in standing for the best in water works practice, the establishment of district health officers and laboratories for the examination of water, etc., in rural communities, and action, such as that taken by the New Jersey State Board of Health in licensing water works operators. — R. H. Greenman.

A NEW PROCESS FOR NEUTRALIZATION AND SIMULTANEOUS RECLAMATION OF CORROSION LIQUORS. *Jungfer.* Zentralbl. f. Gewerbehyg., Jan., 1919, 7, No. 1, 1–5.— It has long been a problem how to reclaim the sulphuric acid and iron sulphate in the waste water from iron corrosion processes. During the war, when sulphuric acid was difficult to obtain, the bisulphate had to be used as a substitute. In this case there was no practical and inexpensive method for reclaiming the waste products, and plants which used this substitute were more or less forced to the unhygienic procedure of letting the waste water trickle or run off. Likewise, when sulphuric acid is used, there is no accepted method of purification of the waste products.

Hydrochloric acid can, however, be used. The waste water then contains ferrous chloride equivalent to about 4 or 5 per cent. uncombined acid. The author describes in detail the process employed for the last four or five years by the firm of Wolf, Netter and Jacobi, whereby the iron and hydrochloric acid are

both reclaimed. The reaction $FeO+2HCl = FeCl_2+H_2O$ is a reversible one if superheated steam is passed into the ferrous chloride. By this method 90 per cent. of the chlorine content of the washing solution is obtained, and can be used over again in the industry. The iron oxide can be sold for forging.

The question of removal of waste water in this case is solved not only from the standpoint of hygiene, but also from that of economy. Through the practical arrangement of the plant, which essentially works automatically, hydrochloric acid is obtained at less than half the present market price. — M. D. Ring.

INDUSTRIAL PERSONAL AND COMMUNITY HYGIENE: HOUSING, ETC.

Your Housing Problem. Ideas for Meeting It, Drawn From an Investigation Among 1,000 Industrial Concerns. Factory, May 1, 1920, 24, No. 8, 1317–1323. — This discussion represents the result of a study of housing as it has been developed by fifty concerns located in some fifteen states. The housing developments considered range from a one-house project to projects involving accommodations for several hundred families. Only three of the concerns included in the study reported that they had abandoned their housing work because it did not pay. Of the twenty concerns making a definite answer on the question of labor turnover, only one indicated that housing had not reduced turnover and tended to increase the efficiency of the workers. Of the group of fifty concerns, about half had organized subsidiary companies to carry on their building operations.

In speaking of types of buildings, the report discusses in some detail the Ingersoll concrete house. This form of construction has met with success recently in Union and Phillipsburg, N. J. It has the advantage of moderate cost, attractiveness, and adaptability to rapid construction. In Phillipsburg one of these four-room houses costs $2100 complete. The cost of the land is not included in this figure. A record of forty-eight hours has been set for erecting the walls and putting in rough floors in an Ingersoll type of house. While the lines are simple, and standardized, variations may be obtained by different porch construction.

The experiences are cited of several companies which have undertaken housing effectively on a large scale. Among these companies are the Youngstown Sheet and Tube Company, the Whiting-Plover Paper Company, the Norton Company, and the Connecticut Mills Company. The plan of the Norton Company for selling homes to its employees is given in some detail. One interesting feature of this plan is the detailed statement provided each purchaser explaining how much he owes and how his payments are to be made. — C. H. Paull.

Health Center for Norfolk. Survey, March 13, 1920, 43, No. 20, 739–741. — This is a brief outline of a plan for a health center in Norfolk, Virginia. The buildings in the health center are to include a prenatal building, juvenile courthouse, emergency hospital, administration building, detention home, and general medical building. Perhaps the most characteristically social element of the work of this health center is to be connected with the activities of the prenatal building. This building is to be attractively decorated throughout and on one of the upper floors is to be a model flat. Special lectures are to be arranged for. — C. H. Paull.

Removing Social Barriers by Zoning. *Charles H. Cheney.* Survey, May 22, 1920, 44, No. 8, 275–278. — As a basis for his discussion of a zoning plan for cities, the writer cites the Portland (Oregon) scheme. Believing that the one family home has the greatest social value, provision has been made to restrict the building in two-thirds of the city area to single family dwellings. The congestion in these restricted portions of the city will approximate eight to twelve families per acre. Such a zoning scheme as that proposed for Portland will not bar business block or apartment house building. Business districts are arranged for within easy walking distance of the single family zones. Apartment house districts are similarly provided for.

"Zoning must be flexible, not rigid, and reasonably easy of amendment." Public needs change, and with these changes should come wise readjustments from time to time in the restrictions placed upon the zones affected. — C. H. Paull.

INDUSTRIAL INVESTIGATIONS AND SURVEYS

WAGES AND HOURS OF LABOR IN COTTON-GOODS MANUFACTURING AND FINISHING, 1918. U. S. Bur. Labor Statis., Bull. No. 262, Nov., 1919, pp. 147. — Earnings per hour, hours of labor per week, and full-time and actual weekly earnings in the cotton-goods manufacturing and finishing industry of the United States for the year 1918 are presented in this report. Separate figures are shown for manufacturing and finishing. Comparable figures are shown for 1916, and summaries for each year, except 1915 and 1917, from 1907 to 1918 for cotton-goods manufacturing and from 1911 to 1918 for cotton-goods finishing are also shown. — M. C. Shorley.

WELFARE WORK FOR EMPLOYEES IN INDUSTRIAL ESTABLISHMENTS IN THE UNITED STATES. U. S. Bur. Labor Statis., Bull. No. 250, Feb., 1919, pp. 139. — The field work of the investigation reported in this bulletin extended over a period of twelve months, in 1916 to 1917, and thirty-one states were visited in connection with the study.

In Chapter I on *Health Measures for Employees*, the findings are reported relative to (1) medical, hospital, and surgical treatment, including first-aid equipment, system of following up absentees, average number of cases treated, construction and equipment of standard emergency hospital, dental and other special work, physical examination on entrance, periodic physical examinations, company hospitals, cost of treatment to employees, treatment of tuberculous employees, and medical fees; (2) rest periods; and (3) vacations and sick leave.

Among the subjects included in subsequent chapters are: drinking-water systems; washing-up and locker facilities; lunch rooms and restaurants; indoor and outdoor recreation; education; disability funds, pensions, and group insurance; administration of welfare work; and social betterment among employees' families. — M. C. Shorley.

INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS: SPECIAL TESTS IN THE SELECTION OF EMPLOYEES

CHANGES IN SOME OF OUR CONCEPTIONS AND PRACTICES OF PERSONNEL. *W. D. Scott.* Psychological Rev., March, 1920, 27, No. 2, 81–94. — "Those of us who are engaged directly in personnel administration in such organizations as educational institutions, the army, the navy, industry and commerce, use the term personnel administration to include securing, testing, selecting, hiring, placing, training, supervising, disciplining, stimulating, directing, transferring, discharging, and promoting each individual concerned; and in developing the *morale*, increasing the *esprit de corps*, and creating and sustaining a contented and efficient group of individuals." The author discusses changes that have taken place in our conception of *personnel* work as a problem and practice in the above sense, especially the change in point of view by which we now treat men in groups, less as reasoning men and more as controlled by sentiment. Industrial groups, for example, are influenced as much by pride and by sentiment as by the logic of the greater gain. There are also changes in our conception and practice of education, as we take more the behavioristic point of view and define education as profiting by experience. The mechanic at the bench is receiving an education if he is profiting by his experience. In planning his training program the personnel director is coming to see that his responsibility is not met by providing formal classroom continuation school instruction; he must supply each employee with richness of experience, and see that he profits continuously by his experiences as an individual worker, as a member of the entire body of employees, as a prospective junior executive, as a member of a family, and as a citizen of the state. The biological relationship existing between the worker and his work must be emphasized. The writer objects to the variety of industrial psychology which starts with the intention of analyzing man and job for the purpose of making as close a fit as possible between the two. The right idea is rather to regard man and job as a living progressive situation; we must think of functional unity. Personnel work involves the shaping of the growth of this productive complex in forms of greatest economic effectiveness and ultimate social value.

The idea of vocational guidance has also been undergoing change. During the past few years

fairly adequate job analyses have been made of most positions in many of our industrial and commercial organizations. Great advance has been made in our understanding of human nature. We are in the way of doubling the productive power of the human race by these new scientific methods. Such an increase in the efficiency of the race will probably be due to further increase in our knowledge of personnel rather than to further increase in our knowledge of the material universe. — G. E. Partridge.

TRADE UNIONISM AND TEMPERAMENT. THE PSYCHIATRIC POINT OF VIEW IN INDUSTRY. *E. E. Southard.* Ind. Management, April, 1920, 59, No. 4, 265–270. — The writer of this article believed he had found a relation between types of unionism as outlined by Hoxie and functional types of temperament as classified by the ancient Greek physicians, Hippocrates and Galen.

Temperaments	*Types of Trade Unionism*
Phlegmatic	Business Unionism
Sanguine	Uplift
Melancholic	Revolutionary
Choleric	Predatory

The phlegmatic type, it is pointed out, represents the average individual who accepts pleasure and pain with relative indifference. This person is apt to affiliate himself with the more conservative type of business trade union. Although it is doubtful whether any single union is definitely an uplift type, craft and industrial unions often express the uplift idea. The sanguine individual, who, according to the modern psychiatrist, is subject to an opposite feeling, the "blues," is attracted by the uplift idea.

There seems to be a definite relationship between the melancholic temperament and the revolutionary type. The confirmed melancholic is apt to center his thought upon certain things until his mental processes amount to delusions. There is an apparent coincidence between this state and the passivity and unpleasant emotional tone of the revolutionary unionist.

The choleric temperament seems characteristic of the predatory type where there is little evidence of the high intellectual levels of the revolutionary type. With the predatory unionist, the action of the individual is dominated by instinct. He acts upon impulse. — C. H. Paull.

ABSTRACT OF THE LITERATURE

OF

INDUSTRIAL HYGIENE

VOLUME II OCTOBER, 1920 NUMBER 6

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GENERAL

THE HOURS OF WORK PROBLEM IN FIVE MAJOR INDUSTRIES. Nat. Ind. Conference Board Pub., Research Report No. 27, March, 1920. — This report is a useful summary of five previous reports upon the hours of work problem in five industries, namely, cotton, wool, silk, boot and shoe, and metal manufacturing. All of these individual reports have been abstracted in the JOURNAL OF INDUSTRIAL HYGIENE and attention need now be given only to the two new features which the report introduces.

1. *Hours of Work and Social Factors.* — The proper length of the working day cannot be determined through studies of production, fatigue, health, or any single factor. "Other so-called social factors, that is, the need of sufficient time for recreation, amusement, home-life, and self-development must also be taken into account. . . . These social factors have repeatedly been emphasized by students of labor problems." The fact that the leisure of the worker is often spent unwisely does not vitiate the broad general principle that "no schedule of work should be regarded as acceptable which does not allow reasonable leisure for domestic companionship, rest, recreation, and the general requirements of good citizenship." It is then brought out that shorter hours of work must afford better opportunities for the Americanization of foreigners and for kindred results of equal value but it is likewise held that society to progress must produce in excess of immediate wants "so that there shall be a surplus of capital for the undertaking of new projects, for the acquisition of more things which contribute to well-being and to the enjoyment of more pleasures." Production thus makes possible all the advances which we can consider most desirable, and in the end studies of the hours of work problem must concern themselves with the numerous interrelated

factors which are concerned with production and must not dwell upon single phases of the problem.

2. *The Shorter Week-Day and Unemployment.* — Several opinions from labor organizations are cited which maintain that reduction of hours must remedy unemployment and it is acknowledged that as a temporary expedient such a course may be useful. It is, however, held that there is an essential bond between production and employment. Reduce hours and reduce production, increase thereby the cost of the article manufactured with consequent loss of sales, and a vicious circle is entered which, in the end, makes only for more unemployment. "A more constructive policy would be to seek a better adjustment of industrial effort, so that every worker may be employed where he is most needed, seasonal fluctuations may be reduced as far as possible, and the means of distributing finished products more nearly perfected. Even under abnormal conditions this policy of reducing hours to relieve unemployment is at best an expedient of only doubtful value. Moreover, such a policy, particularly in times of high prices and depleted supplies, would prove seriously detrimental to the best interests of the workers and of the public in general." — C. K. Drinker.

Minimum Quantity Budget Necessary to Maintain a Worker's Family of Five in Health and Decency. U. S. Bur. Labor Statis., Month. Labor Rev., June, 1920, 10, No. 6, 1–18. — This budget, recently prepared by the Bureau of Labor Statistics, is discussed under the following headings: Food; Clothing; Housing; Heat and Artificial Light; Furniture and Furnishings; Miscellaneous. — R. B. Crain.

Occupational Diseases among Porcelain Workers. *F. Koelsch.* Zentralbl. f. Gewerbehyg., March, 1920, 8, No. 3, 41–45. — The author reports the results of investigations made on 1000 porcelain workers, half of whom were men and half women, almost all of average physical development, strength and nutrition. Dust plays the chief rôle in producing disease. Frequent signs of irritation of the connective tissue of the eye, especially catarrh, were found. These were most numerous in the workers in the firing house and in the glaziers.

Chronic nasal and pharyngeal catarrh, and occasional nasal polypi and diseases of the middle ear were noted. Most common were complaints referable to the upper and lower air passages, catarrh of these passages, short breath, and general asthmatic conditions. In about half of the cases symptoms were found which could only be interpreted as arising from dust deposits in the lungs. In general, men were more often affected in this particular than women, probably owing to the fact that they averaged greater length of service. Two per cent. had pulmonary tuberculosis.

Many complained of stomach disturbances and loss of appetite due to continual swallowing of dust. There is a possibility of ventricular ulcers. Other writers are cited who have similar findings among workers in porcelain and cement dust.

The rheumatism found is probably of climatic origin. Minor ailments are noted as, for example, abrasion of the epidermis of the finger pads, and pains in the abdomen, especially among old women, resulting from heavy lifting. — M. D. Ring.

Annual Report of the German Factory and Mine Inspectors for the Years 1914–18. — For the last five years there has been an almost complete suppression of news about industrial hygiene in Germany, formerly so rich a field for articles on this subject. Scattered reports of the effects of the war on the workers, especially the effect of hard physical labor on women, came to us from time to time, and toward the middle of 1918 the British allowed the National Council of Defense to see some photographs of articles written by Koelsch of Munich on poisonous explosives, but these had necessarily a very limited circulation. It is, therefore, with great interest that we welcome three bulky volumes of the Factory Inspection Reports for the German Empire which cover the four years of the war. There is much matter deserving of study in the sections on wages, hours, child labor, women's labor, accidents, and so on, but this article must be confined to the industrial diseases alone.

The German method of presenting these reports has always been irritating to the foreign reader because of its apparent lack of editorship. Each district inspector sends in his report, covering all of the regular subjects, but nobody brings the separate reports together into a comprehensive whole. It has always been quite impossible, therefore, to discover

how much lead poisoning there is in Germany in proportion to the numbers employed in lead industries, and how many cases are serious, how many mild. No comparison can be made between a lead trade in Germany and the corresponding one in England, because the statistics for Germany are not summarized and presented in usable form. This might be overcome by a careful study of each report if they were uniform, but they are not. For instance, take dinitrobenzene poisoning during the war. The Düsseldorf inspector reports his cases on the basis of men and women employed in dinitrobenzene, but gives only the deaths, not the non-fatal cases, while the Wiesbaden inspector gives all cases, fatal and non-fatal, but does not give the numbers employed in such work. Moreover, the reports of many inspectors need a medical editor and their value would be greatly enhanced by his work. We Americans, however, are the last people who have a right to criticize — we who have only begun in a few states to collect and publish the facts about industrial diseases.

Germany's experience with the war industries was in many ways similar to that of the other belligerent countries, but in other respects it was quite different. The features of industry common to all the fighting countries were these. The working force was composed of women and young persons unaccustomed to heavy work, of men from sedentary occupations, of the old, and the physically handicapped; new and dangerous industries were begun — making and loading of explosives and war gases; war plants were hastily constructed in poor locations, with insufficient accommodations for washing, bathing and eating, without proper dust-removal apparatus and other safeguards; speed in production was insisted on at the expense of the health and safety of the workers; there was an enormous labor turnover so that a continual stream of untrained and unselected workers passed through the factories; and finally the influenza epidemic of 1917 made great inroads on the working force in all the warring countries.

But besides all these disease producing factors which were to be found in the allied countries as well, and in our own country for fully two years before our entrance into the war, Germany had other handicaps, far more serious. The effect of the blockade stands out on every page of this report. While in Great Britain and France the health of the munition workers on the whole improved, in spite of long hours, because the increased wages enabled them to buy better food than ever before, in Germany the food blockade resulted in a progressive loss of strength which is shown again and again in the sickness records given by the factory inspectors. In a Breslau textile factory the cases of sickness among the men rose from 19.1 per cent. in 1913 to 39.3 per cent. in 1918, and among the women the increase was from 30.9 per cent. to 88.6 per cent. Sometimes the record shows an initial fall in the sickness rate, before the blockade, under the influence of high wages and good food, followed by a rise both in frequency and severity of sickness as the war went on. This is shown in the following record of a Dresden factory employing between 8000 and 9000 men and women.

Year	Sickness per 100 Employed	Per Cent. of These Incapacitated
1914	73.8	26.3
1915	68.6	21.4
1916	71.0	23.3
1917	85.0	34.9
1918	95.0	54.2

Thus not only was the number of the sick larger but the severe forms of sickness were doubled. The increase occurred especially in the digestive diseases and in inflammations and suppurations, the latter being responsible for only 7.9 per cent. in 1913 and 13.1 per cent. in 1917.

Saxony had apparently little to do with explosives but much with the machine and metal industries. The inspector for the Leipzig region states that much more harm was caused by lack of food than by long hours and night work, as shown by the fact that the non-industrial population had as much ill health as the industrial. Sometimes, indeed, the factory workers, especially those engaged in heavy work, were in better health than the rest of the population because extra rations were allowed for especially strenuous jobs. Actual industrial diseases were diminished in Saxony, general diseases were increased. The miners of the Freiberg region suffered very much from lack of food in that bleak and barren country where so little can be produced from the soil. The failure of the potato crop of 1916 forced the Germans during the winter and spring of 1916–1917 to subsist chiefly on turnips for

months at a time. This "Kohlrüben Winter" left unmistakable traces on the sickness and mortality rates. In Chemnitz the general death rate, the rate for tuberculosis and that for the aged rose as follows:

Year	General Rate per 10,000	Tuberculosis per 10,000	Over 60 Years per 10,000
1913	136.7	12.64	166.0
1916	130.4	13.32	264.0
1917	170.4	23.63	471.0

During that winter it often happened that both men and women factory workers had to give up from exhaustion or were overcome while at work. Married women with young children suffered most. There was a rapid and striking increase in tuberculosis. In one large typewriter factory in the Chemnitz region during 1918, from forty to fifty persons a week, out of a force of about 4000, had to quit work because of tuberculosis. In spite of the erection of factory kitchens to supplement the government rations and in spite of increased wages, malnutrition and the resulting exhaustion grew constantly worse during the third and fourth years of the war, and when in the fall of 1917 the influenza spread among these depleted people, some factories were obliged to close down. Mention is made of three epidemics of influenza and one epidemic of dysentery, in 1917, perhaps connected with the turnip diet.

A second effect of the blockade was the lack of soap and of protective clothing, rubber gloves and boots, waterproof aprons, and later of even ordinary underwear and overalls. Soap was strictly rationed and although on recommendation of the factory inspectors this ration was increased for workers in poisonous substances, still it was not only insufficient but most unsatisfactory. The soaps used were irritating, caustic. We are told that laundry workers suffered from the effects and there was no way of protecting them. In the soap factories inflammation of the eyes appeared for the first time, caused by the large amount of alkali in the soap. The officially approved formula for soap powder was as follows:

Fatty acids	4.5 per cent.
Soda	30.0 per cent.
Sulphate	5 to 10 per cent.
Water glass	10 to 15 per cent.
Kaolin	0.5 to 1 per cent.

Another effect of the blockade was the lack of fuel which kept the working rooms cold and prevented proper ventilation. Sometimes employers tried to heat with open coke burners, causing dangerous contamination of the air with carbon monoxide. Lack of rubber and other raw materials prevented the replacement of such important apparatus as suction fans for dust and fumes. Finally the blockade shut out many of the chemicals which Germany had always used and for which substitutes had to be found. These substitutes were sometimes more dangerous than the original material, sometimes so unfamiliar to the people using them that damage occurred before proper precautions were instituted.

Much the most troublesome of these substitutes were the mixtures of high-boiling coal tar oils, sometimes containing creosotes, which were used to take the place of the machine oils and lubricating compounds formerly derived from petroleum. Germany has no petroleum, and the "Ersatzschmieroele" which were put on the market seemed to have caused more industrial sickness and disability than any other single substance. In one plant using an oil which contained creosote, there were 200 cases of dermatitis, fifty of them lasting long enough to be classed as occupational accidents. Every report emphasizes the trouble occasioned by these oils. The evil was increased by lack of oil-proof material for gloves and aprons, for the clothing would get saturated with oil and the eruption spread all over the body. Ulcers would form and cause weeks of disability with feverishness and general malaise. The lack of neutral soaps then became very distressing, the war soap only adding to the irritation of the skin. Naturally there was no vaseline, nor do other bland ointments seem to have been abundant.

Eczemas and other forms of skin disease were also caused by the use of anthracene and naphthalene to impregnate wood for railway ties and telegraph poles. The men who carried these on their shoulders would get their clothing saturated with the oily substances. Leather substitute for shoes was made by soaking pressed paper in a tarry mixture, and here, too, there was skin disease. More serious trouble followed the use of benzene (benzol) to take the place of turpentine and linseed oil, both of which apparently have always been imported by Germany. Men using these benzene paints and varnishes suffered much from the fumes, especially when painting small spaces like those

in torpedo boats. In the Stettin region, where such boats were built, the attempt was made to drive the fumes out with a stream of compressed air, but even so it was found to be unsafe to allow the men to do this work in the summer more than half an hour at a time. In one factory, solvent naphtha (a mixture of crude toluene and xylene) with a high acetone content was used as a paint thinner, and in one day twelve of the women employed fell sick, four the next day and three the third day. The women acted as if they were drunk; they became irrational, then staggered or fell to the floor with convulsive twitchings. The effect passed away, however, and in a few days they were able to return to work.

Sometimes carbon disulphide was used as a thinner for varnish or lacquer and gave a good deal of trouble. Carbon tetrachloride was used as a mordant for skins, and in one military establishment it caused symptoms of drowsiness, confusion, anesthesia. Wood alcohol, with a strong acetone content, was used as a substitute for grain alcohol, and inflammation of the eyes was attributed to its action.

Of the familiar trade poisons, lead gave less trouble than ever before. There was no raw material for the white lead plants and they closed down. Lead paint was no longer made. The pottery work which required lead glazes was also abandoned almost entirely. On the other hand, arsenical poisoning increased. Finely powdered metallic arsenic was used for "certain purposes," and the effect on the statistics of arsenical poisoning in one factory, as shown below, is quite striking:

Year	Number Employed	Cases of Arsenic Poisoning
1913.	107	7
1915.	64	25
1917.	137	111

This increase is attributed to the necessity for increased production, the impossibility of replacing the dust-collecting apparatus when it got out of order, the lack of proper protective working clothes and of sufficient clean underwear, and the shifting labor, unskilled and uninstructed, many of them war prisoners. War industry also increased mercurial poisoning, for the demand for acetone led to its production in large quantities from acetylene by means of metallic mercury, which was oxidized and then reduced over and over again.

Several substances are described which are not known in American industry. For instance, trichlorethylene was used to clean metallic surfaces instead of naphtha or gasoline. It caused nausea and drowsiness and confusion, so that the susceptible workers had to give it up. Another new substance, perchlornaphthalene, was used to impregnate fabric for gas masks. It was tested by the pharmacologists and pronounced harmless, but it proved to be not only very irritating to the skin, causing confluent ulcers, but also to cause weakness in the legs, uncertain gait. The fumes as well as the dust set up skin lesions and even daily baths did not serve as protection against it. In one plant employing ninety persons there were fifty cases in a space of nine months. In another factory an excellent exhaust apparatus carried off the fumes, but unfortunately spread them over the countryside so that, though the workers were protected, the cattle in the region fell sick and had to be slaughtered, and it was necessary to move the factory to a site where no such harm could be done. It is said that the ulcers caused by "Perna," as perchlornaphthalene was called, yielded promptly to a few exposures to artificial sunlight (Höhensonnenstrahlapparat).

Bakelite, phenol-formaldehyde, used in the United States as a substitute for hard rubber, is known here to set up a dermatitis in the men who make it. In Germany it was heated for use as a lacquer, and the fumes which were given off made women faint. Calcium cyanamid, which was found both by the French and the Americans to be excessively irritating to the skin, is mentioned by Koelsch as one of the war poisons. Among those that were manufactured for use in gas warfare, it is noted that phosgene caused many slight attacks of respiratory disease, and eight deaths from accidental escape of the fumes. Methyl bromide proved to be not only a tear gas but also a poison to the central nervous system. The explosion of a copper kettle resulted in scattering 125 kg. of methyl bromide about. After the room was supposedly thoroughly aired the workmen were allowed to go back. Four of them sickened on the following day, and one died on the third day. Then, after the lapse of two weeks more, work was again resumed and six men fell sick, two of them dying. The inspector believed that fumes of methyl bromide were escaping

from a leak, and the weak odor of methyl bromide was masked by stronger chemicals. No description is given of the symptoms in these cases.

The Germans had their first cases of poisoning from the solvent used for cellulose acetate in airplane manufacture as early as the latter part of 1913. They traced the trouble to tetrachlorethane and after some nine or ten cases of toxic jaundice had developed from this source, the use of tetrachlorethane was forbidden by law, so that the Germans escaped the very serious trouble with airplane dope which the British experienced in the early days of the war. There were seventy cases of toxic jaundice in British airplane manufacture with twelve deaths, before a substitute for this poisonous solvent was found. The solvent used by the Germans, however, was not free from lesser toxic properties, and three or four inspectors report the occurrence of headache, general malaise, faintness, confusion, nausea, loss of appetite, and dizziness among the women using cellulose acetate dissolved in wood alcohol and other solvents, such as ketones, chloroform and formic ether. The production of formic acid fumes from the latter caused irritation of the eyes and nose.

A quite unexpected source of occupational poisoning proved to be the dehydration of vegetables, which was done on an enormous scale; in some places the heat was produced in coke ovens and carried with it carbon monoxide and sulphuretted hydrogen. In one such plant there was 11.1 per cent. of sickness among the employees and in another, 20.5 per cent., while the average for the *Krankenkassa* for that region was only 4 per cent. There was a difference of opinion as to the cause of this increased sickness rate, some physicians holding that it was not caused by carbon monoxide but by the chilling effect of leaving the dehydrating rooms for cold rooms. As precautions, however, proper fuel was ordered, careful firing, and good ventilation; youthful labor was forbidden; and a night shift of only eight hours prescribed.

The most interesting part of the report is that dealing with the manufacture and loading of explosives. Industrial disease was, of course, increased at once as a result of the handling of these new poisons. For instance, a comparison is made between two plants, one of them a machine shop, the other handling explosives, and the rates of sickness for the two are given.

	Metal Works		Explosives	
Employing in 1917	4320 men, 2500 women		Employing in 1917	340 men, 620 women
	Men	Women	Men	Women
Skin diseases	2.1	3.8	11.7	9.7
Respiratory diseases	5.3	9.2	10.3	10.5
Digestive diseases	3.8	8.5	9.0	28.7
Blood and blood vessels	2.3	18.6	1.4	20.5

The rate increased as the war progressed, rising in a Düsseldorf plant from 67.7 per cent. among the men in 1914 to 101.5 in 1918. The principal centers for the manufacture and loading of explosives seem to have been Potsdam, Düsseldorf, the Wiesbaden region and the region around Munich. There seems to have been very little of this work done in Saxony.

The explosives used in Germany were trinitrotoluene, picric acid, dinitrobenzene, trinitranisol, trinitronaphthalene, fulminate of mercury and the nitro powders. Her experience with munition poisons was quite different from that of France, or of Great Britain, or of the United States. In France the favorite high explosive for shells was a mixture of picric acid (trinitrophenol) and dinitrophenol, and it was the latter which gave rise to almost all the serious poisoning in French explosive works. Germany had some slight trouble with dinitrophenol, but apparently it was made only in the course of the manufacture of picric acid, and as this was used only for detonators the amounts handled were small and there was not much exposure to dust. The Germans look upon picric acid as only slightly poisonous, causing usually nothing worse than dermatitis; more rarely systemic symptoms, such as irritation of the throat, digestive disturbance and anemia. Women are said to be more susceptible to it than men.

The favorite high explosive in Great Britain and the United States, trinitrotoluene, was used in Germany at the beginning of the war, but apparently not enough could be obtained, for at the end of 1916 they began to supplement it with dinitrobenzene. In British shell-loading plants there was a great deal of poisoning from trinitrotoluene, and the toxic jaundice characteristic of this form of poisoning was soon made notifiable; no less than 346 cases with ninety-six deaths were reported to the Home Office. In the United States not only the shell-loading plants, but also the manu-

facturing plants for T.N.T., had a great deal of poisoning—how much, our faulty methods of factory control make it impossible to say. In Germany as in France, trinitrotoluene was considered one of the milder poisons, provided it was pure. In neither country did the pure substance give rise to serious poisoning, even when, as in Germany, it was mixed with ammonium nitrate. The use of this mixture, known as amatol, in the United States and in England had the effect of increasing T.N.T. poisoning, because ammonium nitrate is hygroscopic and keeps the skin of the workman's hands and arms moist and permeable.

Koelsch reports on T.N.T. in the Bavarian factories. He says that they had only light cases of poisoning, cyanosis, headache and nausea, except when it was contaminated with tetranitromethane. He attributes to the latter three serious cases of pulmonary edema, with one death. There was no case of toxic jaundice in Bavarian loading plants. The report from Potsdam, however, is not so favorable. Up to the end of 1917 there had been seven deaths from toxic jaundice, but these occurred all in one factory at one period, and after that there was no more toxic jaundice reported, so that the inspector believes that the T.N.T. in use at that time was probably contaminated with tetranitromethane. There were also seven cases in 1917, and a few in 1918, of catarrh of the intestines, gastric hemorrhage, bronchitis, cardiac neurosis and anemia. In Wiesbaden large quantities of T.N.T. were made, but there was no sickness in connection with it, and only mild cases in the loading plants. In the Magdeburg region one girl died of T.N.T. poisoning, and it is said that the girls employed there were very pale and looked older than they were.

The number of cases — mild, serious and fatal — of T.N.T. poisoning is not given anywhere, and but passing mention is made of twelve deaths from toxic jaundice. One of these was in a little girl of 14 with organic heart disease, who became cyanosed after two days' work and died shortly after — a striking instance of the way all standards as to the employment of the young and the handicapped in dangerous work were thrown overboard during the war.

Trinitranisol was evidently used by the French for they found it to be almost as dangerous a poison as dinitrophenol. The Germans used it a good deal, and the workers suffered terribly from skin diseases, women and alcoholics being especially susceptible. Sometimes poisoning followed a few hours' exposure, and the face was swollen, burning and itching; later the eruption spread to the whole body. In one plant in the Rhineland thirty out of forty women suffered in this way. Fulminate of mercury does not seem to have caused as much dermatitis as in England and over here; certainly it was not nearly so troublesome as trinitranisol. Mention is made of fumes of nitrogen oxides and nitrous ether in the manufacture of fulminate.

The greatest single cause of sickness and death in American explosive works was the evolution of nitrogen oxide fumes in the production of gun cotton and picric acid. In England also there were a good many cases of nitrous fume poisoning. French munition plants, apparently, were free from this danger, and there is little mention of it in the German reports. The one from Wiesbaden speaks of four non-fatal cases, and the one from Nürnberg-Fürth of eight cases. For anyone knowing conditions in American gun cotton works and picric acid works, it is hard to understand how Germany escaped with so little trouble from the nitration processes, when we had so much. Ether poisoning is not mentioned in connection with smokeless powder manufacture, which makes one infer that the German method calls for some other solvent than ether. Nitroglycol was used apparently in mixed powders instead of, or in addition to, nitroglycerine and is said to volatilize more than the latter; but the symptoms are apparently the same. Trinitronaphthalene, when used in powder form, set up inflammation of the eyes and mucous membranes, but not after the producers began to granulate it instead of powdering it.

The chief poison in German munition works was dinitrobenzene, and most of the reports deal very fully with it, for wherever it was used it caused far more sickness and death than any of the others.

The danger with D.N.B. is from fumes, but far more from contact. In Bavaria from 1915 to the end of the war there were fully 1000 cases of D.N.B poisoning and many of the victims had from two to five attacks. There were, however, only twelve deaths. In one factory the cases of poisoning reported averaged — calculated on the basis of the average payroll — 14.7 per cent. in 1917. The maximum, 30.8 per cent., came in summer; the

minimum, 2.3 per cent., in late fall. Another factory, situated in a windless hollow, had a maximum of 69.7 per cent. in August and a minimum of 13.3 in November.

The districts reporting cases of D.N.B. poisoning are Potsdam, Bavaria, Düsseldorf, Wiesbaden, Oberpfalz, Oberfranken, Ludwigshafen. In Düsseldorf there were eighty-one deaths — seventy-one men, ten women. These were during five years, as follows:

Year	Number Employed		Deaths	
	Men	Women	Men	Women
1914	660	130	3	..
1915	1603	710	7	..
1916	1516	873	10	1
1917	1998	1315	25	6
1918	2209	900	26	3

No mention is made here of the non-fatal cases, while in the reports from the other regions all cases are enumerated, but the numbers employed are not given, so that no summary can be made of the proportion of sickness and of death among D.N.B. workers in Germany. In four regions, excluding Düsseldorf, there were altogether 1923 cases of poisoning and twenty-two deaths. Adding the Düsseldorf figure of eighty-one, and six from Wiesbaden and four from Breslau, there seem to have been altogether 113 deaths from D.N.B. These figures are simply collected from the different reports and it is possible that some have been overlooked. Whether the Düsseldorf region had more such work than all the others put together, or had much worse conditions, is not stated and no explanation is given for these eighty-one deaths. The proportion of cases of D.N.B. poisoning among women was greater than among men: in 1916 it was 66 per cent. as against 56.7 per cent. for men; in 1918, 119 per cent. as against 100.5 per cent. One of the Wiesbaden plants had to close down because of "anilismus" (cyanosis, headache, dizziness, faintness, etc.) among its force. The inspectors state that, in contrast to the other explosive poisons, practically everybody seems to be susceptible to D.N.B.

The symptoms of D.N.B. poisoning are: general malaise, sense of weariness, loss of appetite, itching, roaring in the ears, dizziness, fainting, palpitation of the heart and sleeplessness. The lips become blue, with marked pallor of the face; there is sweating, vomiting, cramps, swelling of the legs, difficult urination, and, in women, paralytic symptoms. No description is given of the fatal form.

The inspectors seem to have made valiant efforts to safeguard their charges against the effect of these new and unfamiliar poisons but their difficulties increased as the war went on, even though the knowledge gained of the nature of the poisons was a help. But soap grew scantier and poorer, rubber gloves were unattainable, even stuff for aprons was hard to get. The employees were more and more unfit to stand the exposure to poisons — exhausted women, old and sick men, young girls and boys. Finally, the food blockade, which was more stringent each year, and the terrible influenza epidemics all combined to render the workers defenseless against attack from poisonous fumes and dust. Yet a great deal was done to help. The food ration was the largest that was allowed, and in addition many factory owners installed their own kitchens and lunch rooms. Milk was somehow procured and given free to workers in D.N.B., picric acid and T.N.T. Because poisoning was so much increased in hot weather, Koelsch in Bavaria had the hours of work changed so as to avoid the hottest part of the day, from 10 in the morning to 4 in the afternoon, and to utilize the early and late coolness. In one plant during the rest periods milk was given and regular oxygen inhalations, which were considered of decided benefit. In a loading plant in the Rhineland for D.N.B. and trinitranisol, they succeeded in making almost all the work mechanical and the work benches were provided not only with suction fans to carry off fumes and dust, but with a stream of compressed air. In a plant in Bavaria the D.N.B. was conveyed in closed pipes and discharged into closed receptacles, yet even here four deaths from poisoning are recorded. Although in most places the washing facilities, lunch rooms, and so on are said to have been insufficient, the famous plants of Friedrich Bayer and the Krupp works were complete in every detail. — Alice Hamilton.

Opportunities for the Study of Industrial Medicine in the United States. *Augusta Shuford.* U. S. Bur. Labor Statis., Month. Labor Rev., May, 1920, 10, No. 5, 142–154. — "This article is based mainly upon answers sent to the heads of medical colleges and of the medical faculties of universities inquiring as to the facilities offered by educa-

tional institutions and in clinics for the study of industrial medicine. No attempt is here made to give an exhaustive list of educational institutions including industrial medicine or hygiene in their curricula or of clinics specializing in the treatment of industrial diseases or accidents, but merely to present a substantially true picture of the situation regarding the facilities offered for the training of industrial physicians by noting the most conspicuous work being done along this line and citing typical but less ambitious efforts." — R. B. Crain.

A Factory University. School and Society, July 3, 1920, 12, No. 288, 23–24. — In its recently opened industrial university, the Goodyear Tire and Rubber Company is undertaking the education of more students than the University of Wisconsin. It has an enrollment of 6200 and a faculty of 117 members. Classes are in session from 7 A.M. to 11 P.M. The subjects range from grade-school studies to post-graduate technical studies. There are several branches: Americanization, production, commerce, sales, and household arts. Special attention is given to apprentice courses for machinists and for draftsmen, and in these courses there has been an attempt to work out the best combination of shop work and school work. — G. E. Partridge.

Industrial Training; What Shall We Subtract, and What Shall We Add, in the New Century of the Education of the Deaf? *J. Stuart Morrison.* Am. Annals of the Deaf, May, 1920, 65, No. 3, 213–224. — Because of the great changes that have taken place in industry everywhere, due to the introduction of machinery, the tendency is for rapid drift toward the city. Agriculture, for these reasons, is a poor subject for the industrial training of such classes as the deaf. It is useless to teach trades in which the demand is slight. We must eliminate, too, such forms of manual training as do not lead directly to trade teaching. Omit all antiquated methods of doing things. Leave out the hand-made in every case in which the machine-made is superior, unless hand-work is necessary introduction to work with the machine. Do not try to do too many things passably well. Add to the curriculum any trade for which there is a large or growing demand. Make close coordination between the classroom and the workroom. Put in every piece of machinery necessary to make the shop modern. — G. E. Partridge.

Opportunities Open to the Textile School. *H. W. Nichols.* Educational Rev., April, 1920, 59, No. 4, 332–341. — The lack of interest in their work manifested by many employees in the cotton mills of Massachusetts has led several superintendents to co-operate with the textile schools by giving scholarships or paying for the education of capable boys. There are three classes of students that may be attracted to a textile school: (1) the student who wishes to learn to operate some one machine; (2) the person already employed as an operative who wishes to make advancement; (3) the student of more advanced education in general lines who wishes to make textile work a life occupation, and who seeks to fit himself for an executive position. To the first class the schools of the state have offered practically nothing. The reason is that the schools have not hitherto obtained the co-operation of the mills. Either the school must build a mill to meet this need, or the mill must offer instruction in the part of the work that the school cannot give, the latter plan being the better at least in Massachusetts. For the man who is looking for something better than the routine life of the operative, the textile school is already doing much. The evening schools provide good opportunity for him. There is much being done also for the student who can give his whole time to acquiring knowledge of textile manufacturing, but here again closer co-operation is needed between the school and the mill. A great advance in the textile industry would be made if the mills would undertake to send promising men to the schools for education, continuing to give them practical training in the mill. — G. E. Partridge.

The Workers' University of the International Ladies' Garment Workers Union. *L. S. Friedland.* School and Society, March 20, 1920, 11, No. 273, 348–350. — Both in principle and in method, adult and trade-union education is still in its infancy. Even in England and Denmark this is still the case. Labor education is not essentially a training for vocation; rather it is a means of developing avocations. The basis of all education of adults is the relation of the individual to the various groups to which he belongs. Industrial education must include a knowledge of the

whole sweep of one's occupation. There must be more attention in this education to the human element. The right use of leisure must be taught. The educational activity of the I. G. W. U. began in 1914 on these lines and it now includes a large number of schools in which general cultural subjects have a large part. — G. E. Partridge.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

MENTAL

THE MODERN SPECIALIST IN UNREST. PLACE OF THE PSYCHIATRIST IN INDUSTRY. *E. E. Southard.* Indust. Management, June, 1920, 59, No. 6, 462–466. — This is the third of a series of articles on "Mental Hygiene in Industry," which the late Dr. Southard has contributed to *Industrial Management.* In dealing with many of the problems of human relations in industry it is pointed out that the psychiatrist can render able assistance to the employment manager. Turnover, for instance, is often a problem of mental rather than physical adjustment. Such causes for leaving as the following may often suggest to the psychiatrist a line of profitable investigation:

Did not like supervision
Refused to be transferred
Resented criticisms
Did not like working conditions
Work too hard
Agitator
Carelessness
Dishonesty
Drinking
Fighting
Indifference
Insubordination
Too slow

The psychiatrist must deal specifically with individuals rather than with groups. Already he has had to do with that type of unrest which is confined within asylums. His field may well be enlarged to include the less obvious but much more disconcerting types of mental unrest which are to be found in every walk of life. — C. H. Paull.

CENTRAL NERVOUS SYSTEM

NEUROSES FOLLOWING TRAUMA, AND MEDICAL TESTIMONY. *Th. Rumpf.* Deutsch. med. Wchnschr., May 6, 1920, 46, No. 19, 507. — The strictly traumatic neuroses must be differentiated, on the one hand, from diseases with an organic basis, such as concussion, epilepsy, tetanus, myasthenia, hyperthyroidism, which are recognized by their objective manifestations, and, on the other hand, from the functional neuroses, neurasthenia and hysteria. The boundary line between neurasthenia and hysteria cannot be very sharply drawn. The classical picture of "nervous exhaustion" arises rather rarely as the result of a single accident; usually it is produced by a long-continued strain or series of small accidents, in a previously healthy individual. Hysteria is a sort of catch-all classification for cases in which we find an inconsistently abnormal physical or psychical reaction. It is considered never to be an acute disease, but to be either congenital or gradually developed in the course of a lifetime.

The true traumatic neurosis or fear neurosis (Schreckneurose) is characterized by the fact that it develops as the physical injury heals. It is doubtless emotional in origin, and its manifestations often resemble those commonly produced by emotion: flushing, faintness, and nausea. The well-known vasomotor symptom-complex is an excellent example. The symptoms are often similar to those of hysteria, from which they may be distinguished by the fact of their acute origin and their improvement under appropriate treatment, although of course it must be remembered that a traumatic neurosis may develop in a neurasthenic or hysteric. On the other hand, organic injuries especially those of the head may simulate fear neuroses; but the former tend to disappear under appropriate surgical treatment, while the latter tend to be aggravated. Of course, mixed forms of all these conditions occur, but it is important to differentiate them as far as possible.

All of the post-traumatic neuroses were formerly considered practically incurable, and they are so as long as the patient remains out of work and on a pension. His mind comes to dwell on his symptoms and to magnify them, and it becomes his sole aim to obtain protracted

compensation. The aid and advice of a lawyer often makes his condition so much the worse. Consciously or unconsciously such patients often become malingerers in addition.

The only practical treatment of such cases is final settlement of the claim by a lump sum as soon as possible after the accident. In the author's series, 70 per cent. of cases were thus cured in a short time, and 16 per cent. improved. The earlier the settlement is made, the less nervous is the patient's temperament, and the younger he is, the better is the prognosis. Hypnotism has been used by Nonne, but has not been successful in other hands.

The compensation due to patients, the victims of traumatic neuroses, is better decided by an experienced physician or board of physicians, than by the lengthy processes of a court of law. The attending physician must attempt to estimate the extent of physical and psychic damage, any attempt at malingering, and the amount and duration of disability. An excellent means of deciding any disputes which may arise is a board of impartial physicians, presided over by a lawyer, before which the plaintiff's and the defendant's doctors may plead as attorneys. — T. J. Putnam.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

Corrected Eyesight. *Hal Brown.* Factory, July 1, 1920, 25, No. 1, 55–56. — The writer calls attention to the fact that frequently minor eye defects are more serious than severe and quite obvious defects. In the case of the latter, eye muscles will not attempt to obviate difficulties of vision, while in the former, because of the possibility of increasing the power of vision by strain, the muscles will make the added effort.

In the plant of the Whiting and Davis Company, where there is a large amount of fine work on various forms of jewelry, all employees' eyes were tested with the following result: —

Glasses were ordered for	83.3 %
Glasses used were satisfactory for .	8.3 %
No glasses were needed for	8.4 %

After employees had been satisfactorily provided with glasses, an increase in production was noted. This increase amounted to 28.03 per cent. when two months were compared. — C. H. Paull.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

Quarry Accidents in the United States during the Calendar Year 1918. *Albert H. Fay.* U. S. Bur. Mines, Tech. Paper 245, April, 1920, pp. 51. — This report contains tables presenting information on accidents (1) in all quarries; (2) in classified quarries, i. e., cement rock, granite, limestone, marble, sandstone and bluestone, slate, and trap-rock; and (3) according to principal causes. — M. C. Shorley.

Industrial Explosion Hazards: Gases, Vapors, Flammable Liquids, and Dusts. National Safety Council, Safe Practices, No. 34, pp. 12. — The first part of this pamphlet is devoted to a discussion of gases, vapors, and flammable liquids; the second part deals with dusts and the part played by building design, ventilation and plant cleanliness in the prevention of dust explosions. — M. C. Shorley.

Conveyors. National Safety Council, Safe Practices, No. 35, pp. 12. — This pamphlet points out hazards met with in the operation of conveying equipment and cites methods whereby these hazards may be avoided. — M. C. Shorley.

Analyzing Accidents to Reduce Them. *H. W. Patton.* Factory, Aug. 1, 1920, 25, No. 3, 370–371. — The Burroughs Adding Machine Company has developed a plan of accident publicity by which they present to their employees some of the major characteristics of accidents occurring in their plant. Statistics are presented in three charts. By a simple line chart they show the frequency of accidents for the days of the week for both day and night workers. A second chart is in the form of a dial which shows the frequency of accidents by hours for the day and night. The third chart by means of lines drawn from a human figure shows the frequency of accidents as related to parts of the body. These charts were used in a recent safety exhibit and

appeared at about the same time in the company paper.

Where a high rate of frequency was indicated an attempt was made to explain to the employees the cause. The fairly high rate of accidents on Mondays was accredited to the fact that employees did not settle down to work promptly enough after their Saturday afternoon and Sunday holidays. The frequency of accidents during the latter part of the morning was explained as due to employees becoming hungry and somewhat tired as noon approached. Employees were warned to be on their guard at these times. Other accident tendencies are explained in a similar manner. — C. H. Paull.

THE MEDICAL EXAMINER VERSUS THE CORONER. *Charles Norris.* Nat. Munic. Rev., Aug., 1920, 9, No. 8, 498–504. — Dr. Norris discusses in this article the advantages of substituting the medical examiner for the coroner. Speaking from his experience as medical examiner of New York City, he outlines the qualifications and duties involved in such an office. "One of the most serious tasks that the medical examiner performs is the determination of criminal negligence in accident cases." The medical examiner must be familiar with industry to the extent of being able to determine accurately the significance of chemical and mechanical agents in bringing about death. — C. H. Paull.

INDUSTRIAL SURGERY

PLASTIC OPERATIONS UPON THE THUMB, AND FINGER TRANSPLANTATION. *P. Manesse.* Deutsch. med. Wchnschr., March 25, 1920, 46, No. 13, 352. — The author briefly reviews the literature of "anticheiroplastic" operations, and reports in detail, with illustrations and a diagram, a case in which a thumb was manufactured and a finger transplanted. The patient had lost the distal phalanx of the thumb, the entire first two fingers, and had a stiff, useless ring finger. A strip of iliac crest was implanted into the abdominal wall, and a pedicled graft was made of it, to which the stump of the thumb was sutured, the proximal phalanx being nailed to the bony transplant. In five weeks, the pedicle was severed, and a thumb was modelled out of the tissues with excellent cosmetic and functional results. As the fibrous ring finger was useless for apposition, it was removed by resecting the distal third of its metacarpal, with as little injury to the soft parts as possible, and implanted upon the metacarpal of the middle finger. No attempt at tendon transplantation was made, but some movement was obtained by means of the intrinsic muscles of the palm, and the usefulness of the hand was greatly improved. — T. J. Putnam.

CRITIC OF THEORIES REGARDING DEATH FROM BURNS. *Hermann Pfeiffer.* Wien. klin. Wchnschr., Dec. 11, 1919, 32, No. 50, 1195. — In fatal burns there is a short period in which occur reflex disturbances radiating from bulbar centers. These are quickly followed by the general reaction in which there is evidence of blood and vascular damage — hemoglobinemia, plasma loss, etc. Following this, there is an outpouring into the circulation of a peptolytic ferment which is excreted in part by the kidneys. During this stage there is also a lipoid mobilization in the body and a rise in the protein metabolism. These all result in a leucopenia, lowered blood pressure, lowered body temperature, damage to the adrenals, and then death. In recoveries, the excretion of the ferment is continued by way of the kidneys, and there is a leucocytosis, fever and increase of fibrin in the blood. — Barnett Cohen.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

THE NORMAL EXISTENCE OF ZINC IN THE HUMAN ORGANISM. *C. Ghigliotto.* Abstracted from Ann. fals., 1919, 12, 12–14; Expt. Sta. Rec., 41, 465, by E. H. in Chem. Abstr., May 10, 1920, 14, No. 9, 1373. — "G. reviews conflicting statements in the literature as regards the presence of Zn in the human body, and reports the results of the examination of the viscera of 22 victims of accidental death. The content of ZnO found varied from 0.0015 to 0.0028

per cent. of the viscera. Zn was also found in a human and a bovine fetus. This is thought to be an indication that Zn is a normal constituent not only of the human organism but of the animal organism in general." — W. O. Fenn.

TIME AND JOB ANALYSIS IN MANAGEMENT. V. — HOW TO WORK UP AND USE TIME STUDIES. *William O. Lichtner.* Ind. Management, Aug., 1920, 60, No. 2, 130–139. — A number of paragraphs of this article are devoted to the discussion of the relation of time studies to health and fatigue. Although rest periods have been introduced with considerable success in certain lines of work, the writer feels that the whole question of rést periods is complicated by the individual physical differences of employees. An ideal fatigue study should be made by the research man, the plant doctor, and the nurse, working together. The research man will be most concerned with production records. The doctor with the assistance of the nurse will determine physical conditions which parallel variations in production. At the same time a careful check will be kept upon the activities of individuals under observation to be sure that factors not connected with their work in the shop do not affect their physical condition and thereby their production records.

In the meantime much can be done to prevent fatigue by (1) selecting employees who are physically adapted to their work, (2) training employees in the most efficient and least fatiguing methods of doing their work, (3) providing as far as possible mechanical equipment for keeping fatigue at a minimum. — C. H. Paull.

INDIVIDUAL DIFFERENCES IN OUTPUT IN THE COTTON INDUSTRY. *S. Wyatt.* Industrial Fatigue Research Board, Report No. 7. Textile Series No. 1. His Majesty's Stationery Office, London, 1920, pp. 13. — This report points out that in some operations, such as spinning, the output is controlled almost entirely by the machine, while "drawing-in" (by hand) is entirely dependent on the skill and speed of the worker. Between these two extremes the individual and mechanical factors seem to be combined in different proportions, and one of the aims of the investigation was to determine the extent of individual differences in output in various departments of the cotton trade. The results given are based almost entirely on the figures given in the books of the various mills, the chief source of information being the weekly wage lists. Output depends on many different factors. Although adjustments of the standard piece rates are exceedingly accurate and are supposed to eliminate the variables, these have, nevertheless, been avoided wherever possible and only the figures used for comparative purposes which have been obtained under approximately similar conditions of work. Processes have been chosen which yielded reliable figures over an extended period and in order to reduce the results obtained to a comparable basis, the average, whether in hanks, weight, or money, has been converted to 100 and all other quantities modified in the same proportion. The results given show the mean variation between the actual wages earned and the average wage, which, having eliminated all doubtful factors, the investigators give as an index of variability of individuals. Tables are given for various processes — plain and fancy weaving, mule and ring spinning, etc.

The conclusion arrived at is that spinning shows the least difference between individuals, while weaving and winding give rise to large individual variations in output. Thus the human element in weaving and winding is of great importance, and suggests that it is in these processes, rather than in spinning, that efficiency may be increased and fatigue reduced by the elimination of waste in method and movement. — W. E. C.

STUDIES IN INDUSTRIAL PHYSIOLOGY: FATIGUE IN RELATION TO WORKING CAPACITY. 1. COMPARISON OF AN EIGHT-HOUR PLANT AND A TEN-HOUR PLANT. *Josephine Goldmark* and *Mary D. Hopkins.* U. S. Pub. Health Ser., Pub. Health Bull. No. 106, February, 1920, pp. 213. — This report is the first of a series to be published by the Public Health Service dealing with the problems of industrial working capacity. It represents essentially the application of methods of output and accident quantitation to the study of two large factories, one of them being obviously the Ford Motor Company in Detroit and the other a less easily identified eastern establishment. The first of these plants, as is well known, operates upon an eight-hour basis, the second is represented as comparable in the general character of the metal-working operations carried on, but employs a ten-hour day.

The report is long and presents data gathered in the field by thirty-three individuals. Before making any analysis of the material presented it may be said that three considerations will become prominent in the mind of the careful reader. (1) Can a comparison of two factories under different management give any valid information as to the proper length of the working day? (2) Do output and accident incidence data justify conclusions relative to fatigue? (3) Is it sound procedure to neglect practically entirely the medical and sociological aspects of a problem so important and so pretentiously undertaken as the one in hand? We shall have a more satisfactory basis for the discussion of these points after reviewing the conclusions presented and certain facts relative to the collection of the data upon which they are based.

Summary of Conclusions

I. Relative Efficiency of the Eight-Hour and the Ten-Hour Systems as in Operation at the Two Plants Studied

"A comparison of the 8-hour and 10-hour systems leads to the conclusion that the 8-hour system is the more efficient. This is evidenced by —

"1. *Maintenance of output.* — The day shift: The outstanding feature of the 8-hour system is steady maintenance of output. The outstanding feature of the 10-hour system is the decline of output.

"2. *Lost time.* — Under the 8-hour system work with almost full power begins and ends approximately on schedule, and lost time is reduced to a minimum. Under the 10-hour system work ceases regularly before the end of the spell and lost time is frequent.

"3. *Stereotyped or restricted output.* — Under the 10-hour system artificial limitation of output is widely prevalent. Under the 8-hour system output varies more nearly according to individual capacity.

"4. *Industrial accidents.* — (a) In the absence of fatigue, accidents vary directly with speed of production owing to increased exposure to risk.

"(b) The breaking up of this regular variation by fatigue is indicated by —

"(1) The rise of accidents with the fall of output;

"(2) The disproportionate rise of accidents with the rise of output and the absence of a proportionate fall of accidents with the fall of output in the final hours of the day.

"(c) The importance of fatigue in the causation of accidents is emphasized by the fact that the higher accident risk accompanies the deeper decline of working capacity —

"(1) In the second spell as compared with the first;

"(2) In muscular work as compared with dexterous and machine work;

"(3) At the 10-hour plant as compared with the 8-hour plant.

"(d) The level of the accident rate varies inversely with the experience of the workers.

II. General Data

"1. *The night shift.* — Under the 10-hour system a 12-hour night shift is the rule. The chief characteristics of the 12-hour night shift are the abrupt fall of output in the last two hours and the progressive slowing in rate of production during the night.

"2. *Labor turnover.* — (a) Labor turnover is directly associated with distasteful working conditions, such as long hours, low wages, and undesirable physical surroundings. It is lowered by systematic effort to improve conditions and fit the workers to their jobs.

"(b) Turnover is highest among new employees.

"3. *The effects of rest.* — (a) Recesses.

"(1) *Effect on total daily production.* — Varying results follow the introduction of 10-minute recesses in the middle of the morning and afternoon spells. With some workers the loss of time is not made good and output falls; with others the acceleration due to the recess exactly balances the loss of time and output remains the same. In 12 out of 16 operations studied there was an average increase of production after the introduction of recesses. In operations having two periods of trial the gain in the second period was, on the average, five times greater than in the first.

"(2) *Effect on hourly rate of production.* — Recesses usually lead to a rise in the rate of production in the hours immediately following as compared with the hours immediately preceding the recess.

"(b) Holidays. — Holidays cause an increase in output.

"4. *Rhythm in industry.* — In certain machine operations, notably in lathe work, output is maintained at an even level, instead of falling in the final hours of work. This pe-

culiarity may in large part be explained by the phenomenon of rhythm to which lathe work is highly amenable."

DISCUSSION

1. *Maintenance of output.* — Clearly studies of average as absolute output in the ordinary sense could not form a useful or possible basis for comparison of the efficiency of eight and ten-hour working systems. As a consequence the observers have operated upon a different plan. They have regarded as comparable the deviation of each plant from its own best standard; that is, the relative fall from maximum of each hour at each plant. Thus, instead of expressing the average output per hour as variations from the average hour in the working day, they have expressed them as variations from the *best* hour, as shown by the hour of maximum output. "For our preeminent interest is not in the worker's approximation to his average performance but in his approximation to his best. It is accordingly the maximum hour which we have made our standard of comparison, rating each other hour by its fall from the hour of highest efficiency."

The report, therefore, compares the deviation of each plant from its own best standard — that is, the relative fall from maximum of each hour at each plant — and under this method of comparison it is found that in the 8-hour plant output remains nearer to the production of its own best hour than in the case of the 10-hour plant.

The operations studied were classified under four main heads: dexterous handwork; muscular handwork; machine work on lathes; and miscellaneous machine work. In the 10-hour factory the product was largely brass fuses for 3-inch shells, and in the 8-hour factory standardized parts of an automobile, and effort was made to compare processes which under the above general headings could be regarded as analogous.

A series of twenty-three curves with accompanying tables show rather strikingly the better adherence to maximum effort in the 8-hour factory. One cannot question the fact of this observation. One is, however, sceptical as to whether the major reason for this difference lies in eight hours' work in the one instance and ten hours' in the other. The curves under discussion are of various types, their shape depending to a certain extent upon the character of the task with which they are concerned. "The main features common to all these curves are the rise of output from the level of the first hour of work toward maximum and the fall of output at the end of each working spell and the end of each shift." The rise in the curve is attributed to practice and the fall to fatigue. The curves display these features together with certain differences between light and heavy work already known through the reports of the English Committee upon the Health of Munition Workers. The great deviations from maximum efficiency noticed in the curves of the 10-hour plant are found in the first and last hours of the working day. There is, furthermore, an average tendency toward a lower level of efficiency in the second spell in the 10-hour as contrasted with the 8-hour establishment.

2. *Lost time.* — Figures are presented both in terms of power consumption and direct observation of operatives which show that in the 8-hour plant work with full power begins and ends approximately on schedule, and lost time throughout the day is reduced to a minimum. At the 10-hour plant work ceases regularly before the end of the spell and lost time throughout the day is frequent. These differences are not ascribed by the observers to differences in the excellence of management in the two plants; "they point to a universal tendency. The 'tradition of slowed labor' to which the British Health of Munition Workers Committee ascribes the 'conscious or unconscious slackening of effort . . . during working hours of improper length' is accountable in large part for lost time as well as stereotyping."

3. *Stereotyped or restricted output.* — The practice of voluntary fixation of output is declared to have been very frequent in the 10-hour plant. In fact, the statement is made that "So widespread, indeed, is its influence that operations at the factory should perhaps be classed as more or less stereotyped rather than as stereotyped and non-stereotyped." Such a frank announcement must unfailingly arouse distrust in the mind of the reader in regard to the direct relation between falling output and fatigue, which is the great contention of the report in regard to the 10-hour plant. It is, however, followed by the statement that "Care was taken in the investigation not to include in the general studies of output those processes in which production was to any marked degree thus limited."

The report presents as possible causes for the

stereotyping so prevalent in the 10-hour plant the fear of the workers that on increasing their output the piece rate will be reduced and the possibility that organization of labor may be of importance, but both of these are dismissed as being worthy of no serious consideration. It is held that, "The fundamental cause for limitation of output, however, lies deeper. No group of workers could continue, without physical disaster, to work at full capacity for a stretch of 12 hours at night or 10 hours in the daytime, not to mention the 3 hours overtime irregularly worked at the 10-hour plant. Low speed, wasted time, limited output are in large part the worker's automatic defense against exhaustion, against the overstrain of excessive hours of labor.

"On this point the British Health of Munition Workers Committee has acutely said: 'In so far as hours of work in excess of those suitable for maximal efficiency have been imposed during the last two or three generations of modern industry upon the workers, a tradition of slowed labor must necessarily have arisen, probably in large part automatically, as a kind of physiological self-protection. Without some conscious or unconscious slackening of effort indeed during working hours of improper length in the past, the output might have been even more unfavorable than it is known to have been for the hours of work consumed.'

"For this 'tradition of slowed labor,' for the stereotyping which has been illustrated at the 10-hour plant, the cure is, above all, the reduction of hours of labor."

4. *Industrial accidents.* — This section opens with a useful summary of previous accident incidence studies which in the main maintain that accidents are related rather to speed of production than to fatigue. The authors have presented material in the first section of their report which shows a significant failure to maintain output in the 10-hour plant as contrasted with the 8-hour, and they have related this fall in output to fatigue. They now propose to show that absolute figures giving the hourly accident incidence throughout the day are valuable only in relation to the figures of output and the number of workers engaged. If it can be shown that, as the working day progresses and fatigue begins to develop, the chance for injury to each worker increases, then we shall have a positive correlation between accident incidence and fatigue such as does not exist at the present time. The investigators have taken every precaution to see that the listing of accidents, their exact time of occurrence, their relation to previous hours of work, and the total number of individuals engaged hour by hour are accurately known, and these data are correlated with carefully gathered figures for hourly output.

"At the 8-hour plant the investigation of the Public Health Service covered all accidents occurring throughout the factory during the three months of September, October, and November, 1917, a total of 13,205. The working force during this time averaged 36,000 and was practically stationary. At the 10-hour plant a study was made of the accident records for two years, 1916 and 1917. For these years the accidents numbered 17,516 and 15,728, respectively, a total of 33,244. This was a time of rising employment due to war orders, the working force mounting, between March, 1915, and December, 1915, from 4,720 to 8,200, in 1916 averaging roughly 11,000, and in 1917, 12,000. The entire study, then, covered roughly 46,000 accidents and 50,000 workers."

In the studies of output the use of the "best hour" gave a basis for comparison of the two factories and now, in the case of accidents, a somewhat similar and new basis is used. "In the study of accidents . . . the best hour is that of the minimum accident risk. This minimum should obviously be the standard of comparison, and the important consideration is how far and for what reasons the accident hazard of other hours rises above it. It is evident from what has preceded that it will not do to take simply the hour of fewest accidents as the minimum; our standard of comparison must be the hour of lowest risk per unit of output, the lowest point of the ratio."

Charts and tables are presented which induce the following conclusions:

1. APPROXIMATION OF THE CURVES OF ACCIDENTS AND OUTPUT: SPEED OF PRODUCTION

"In the absence of fatigue, accidents vary in the main with speed of production. They may vary at the same rate with speed, when the curves will be parallel, or at a more rapid rate when the curve of accidents will be of the same general form as that of output, but steeper. This variation is roughly illustrated in certain types of work by the rise of accidents with rising output in the earlier hours of the day.

During these hours the increase of injuries is to a considerable extent automatically determined by the added number of motions with the attendant exposure to danger, or by the generally increased risk inherent in more highly speeded machinery. Similarly, with lowered speed, the automatic reduction of motions and attendant danger will lower accidents at the end of each spell and preserve the correspondence of the curves. Exact variation of accidents with output, though at a more rapid rate, is most closely approximated in both spells at the 8-hour plant, where fatigue is only slightly indicated, and at the 10-hour plant in the first four hours of machine work, the type of activity showing least evidence of fatigue. In both cases the variation of accidents with output is roughly as 4 to 1, or in other words, accidents vary four times as fast as output."

2. DIVERGENCE OF THE CURVES OF ACCIDENTS AND OUTPUT: FATIGUE

"(a) *Disproportionate rise.* — That the variation of accidents with the increase or decrease of output is not a mere mechanical result of varying speed is shown by the fact that the rate of variation is not constant. Both in dexterous work and to a less degree in machine work at the 10-hour plant the rise of accidents is disproportionate to the rise of output. Other factors besides speed of production must account for this increase. Among these, loss of coördination, the readjustment of rhythm to changing speeds, may play some part. Prominent among these factors appears to be fatigue, to which the accident curve, it has been suggested, responds more sensitively and more quickly than the curve of output. According to this hypothesis, fatigue is registered first not in a lessened quantity of work but in impaired quality, in errors and growing inaccuracy. [There is excellent physiological basis for this contention not only in the work of Franz and Woodworth which is quoted, but also in the work of Ash.] In chapter 2 we have traced the decline of working capacity in regard to quantity of output only. Our present data tend to show that, even while output is still rising, the onset of fatigue may be indicated by a disproportionately great increase of accidents.

"(b) *Striking disparity of the curves of accidents and output.* — In all hours of falling output except the final hours of the spells accidents continue to rise with the fall of output. Even at the 8-hour plant, where, as we have seen, the variation of accidents with output is in most hours approximately exact, a fractional decline of output from the sixth to the seventh hour is accompanied by a six-point rise of accidents. In this striking disparity the influence of fatigue in the causation of accidents is seen in conspicuous contrast to that of speed of production.

"(c) *Disproportionate fall of the curves of accidents and output.* — In the final hours of the day accidents fall with the deeper fall of output. In the absence of fatigue, this decline of accidents should be, as we have seen, proportionate to the decline of output, owing to lessened exposure. But the counterinfluence of fatigue breaks up this correspondence. By tending to increase accidents it checks their automatic decline. So much greater, therefore, is the fall of output than the fall of accidents that accident risk still ascends."

These very interesting conclusions are then followed by paragraphs discussing accident incidence in the 10-hour plant in machine work, dexterous work, and muscular work, and the contention that fatigue to a certain degree is responsible for accident incidence is well maintained. One, however, misses a similar group of studies from the 8-hour plant. Inasmuch as we have been led to believe that fatigue is a far less prominent feature of work in this plant it is regrettable that the more exact analysis presented by unit types of work is not given for the 8-hour establishment. It is also regrettable that no data upon accidents for the days of the week are given, since, if fatigue plays the part in accident causation which the report strives to indicate, there should be a cumulative effect up to the period of Sunday rest.

A very interesting section of the report portrays the relation between accident incidence and inexperience. It is shown that from the point of view of safety beginners are undesirable employees. It is, however, held that in studies concerned with the distribution of accidents and the hourly risk, inexperience is unimportant, merely tending to raise the level but not to alter the character of the total accident curve. While this is true we must not neglect the fact that unfamiliarity with any type of neuromuscular activity operates very readily for the production of fatigue, and it is unfair to compare a stable and older group of employees, such as the 8-hour factory possessed,

with a less stable group such as were found in the 10-hour plant. Such an objection is adroitly but not convincingly dispelled by the contention of the report that the 10-hour day is the chief cause of all the evils which the report lists. Reduce to eight hours of work, and the labor instability, lost time, stereotyping, accident incidence, and fatigue would all be cared for simultaneously.

Of the general data presented, that dealing with (1) *The night shift* and (2) *Labor turnover* offers nothing that is unexpected or novel. The next section, however, dealing with *The effects of rest* is worthy of note in view of the large interest in "rest periods" which now exists. The questions to be answered are: "Does the interruption of work lead to a fall of output? Does it enable output to be maintained? Does it do more?"

"In the Public Health Service investigation an attempt was made to obtain exact information on these points, to learn and record the actual effects of a 10-minute break in the morning and afternoon. The inquiry was a difficult one, complicated by the prejudices of both foreman and workers. Fear of losing time and wages, the common dislike of innovations, had to be overcome. In one department the antagonism to the experiment was so great that it had to be abandoned, although two weeks of trial were successful and promised further gains. Moreover, much difficulty was found in keeping under observation for a sufficient length of time the performances of the same persons before and after the introduction of recesses."

"In all, recess periods were introduced in 12 different operations of the 10-hour plant. In 11 of these the average daily output per worker increased after the recesses were put into effect. That the improvement was continuous and showed cumulative benefits is proved by the fact that in the four operations which had two periods of trial the gain in the second period was, on the average, five times greater than in the first; the increase in output, which averaged about 2 per cent. in the first period, averaged over 11 per cent. in the second."

In the 8-hour plant recesses were introduced in several departments but with almost uniform lack of success as regards increasing total output. Differences in the character of stock and a tendency to spurt immediately following the recess are given as partial reasons for the failure of the rest periods in this factory.

Finally, the report shows that after holidays total output rises but that this increase is not observed until a perceptible lag of a day or so has passed.

The last chapter of the report gives preliminary details of rhythm in industry. It represents the single novel feature of the entire work of the Public Health Service investigators and its further details will be awaited with interest by readers in this field.

Attention is first called to the fact that in certain operations — of which lathe work presents a typical example — output remains very constant throughout the working day. There is none of the drop in output curves which is held to portray fatigue. "To establish the presence of rhythm and to compare its degree in different operations, the investigators have used an automatic rhythmometer, which records the worker's motions by electrical contacts on a kymograph, or recording drum." A series of such records are published and display a surprising degree of regularity in the various movements required to complete a typical lathe operation. It is brought out that the inexperienced and slower worker is less rhythmical than the old hand, and the inference is allowable that not only does rhythm mask fatigue in studies of output statistics but it also possibly actually wards off fatigue. The nearer neuromuscular processes approach an automatic basis the less taxing they appear to be.

This rather extended summary will give an impression of the work undertaken by the Public Health Service. Actual reading of the report gives one confidence that the recorded observations have been made with painstaking faithfulness and practically entirely in the field. There is no doubt that much of the data assembled represents a distinct addition to output study, and the reader must feel that for the individual plants in which the work was done real facts have been obtained.

It is, however, very hard to believe that the data permit the rather frank generalizations which the report brings constantly into the mind of the reader. The presentation strikes one more as a well-organized argument for eight hours of work than as a thoroughly dispassionate display of the facts at hand. An opening paragraph of the report is as follows:

"Limitations of the Present Study. It is obvious that complex human conditions do

not admit of the controlled experiments of mechanical and laboratory research, in which variants can be deliberately excluded at will. While the two factories studied are representative of the metal-working industry, and though comparable types of work and operations have been carefully chosen, allowance must yet be made for the inevitable differences existing between any two individual establishments. A brief description of the plants will make this clearer."

Then follows a description in which it is brought out that labor conditions in the 8-hour plant were more stable and better in every way than in the 10-hour plant during the period of study. Later paragraphs relative to "stereotyping" and "restricted output" serve to re-emphasize these facts and cause one to distrust the comparisons which have been made. The report seems to us, therefore, to present interesting and in the main confirmatory data upon output — material re-enforcing the utility of certain methods of study and conclusions which have already been published by English workers. It does not convince us that a 10-hour day *per se* is a less efficient working period than an 8-hour day. Possibly further studies will be available from the 10-hour factory giving the result of shortening hours. When this is done the case will stand upon a firmer basis.

The question as to whether output and accident incidence statistics furnish data justifying conclusions relative to fatigue is one which still lacks anything in the nature of entirely objective physiological backing. Fatigue is undefined as a physiological entity. The word carries with it an implication of muscular and nervous damage but even in the simplest of laboratory preparations this damage is not as yet defined. The question which output statistics can attempt to answer is the extent of self-limitation in any task. It is within our physiological expectations to see any rhythmical task adjusted as to output per hour in accordance with the number of hours to be worked. Such limitation is unquestionably protective and, as Abbé observed years ago, its existence is accurately reflected by the unconscious speeding up which follows a reduction in hours of work. Without the addition of medical and sociological data to show that a 10-hour day induces actual physical and mental harm which are eliminated by an 8-hour day, we are not ready to admit that self-limitation of work justifies a conclusion that the individual is fatigued.

It is unfortunate that the Public Health Service investigators worked practically entirely with the methods of the English Health of Munition Workers Committee and that the United States is thus unable to contribute to the subject a degree of freshness and originality which its importance demands. Certainly, lacking as we do at the present time any objective method for testing fatigue, it is regrettable that the American investigating committee made no real effort to gather material through a well-organized medical section showing, provided it existed, real nervous or physical damage as a result of a 10-hour day. — C. K. Drinker.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

Electrical Equipment in Industrial Plants. National Safety Council, Safe Practices, No. 29, pp. 16. — This pamphlet discusses the dangers of shock, burns, flashed eyes, and mechanical injuries from electrical utilization equipment carrying less than 750 volts, and so located as to be accessible to other than qualified electrical operators. A detailed description is given of proper methods of installing electrical equipment with emphasis placed on their relation to accident prevention. A discussion of methods of rendering first aid in case of supposed death due to electrical shock concludes the pamphlet. — M. C. Shorley.

WOMEN AND CHILDREN IN INDUSTRY

Employment of Women on United States Railroads during 1919. Labour Gaz., May, 1920, 20, No. 5, 581–582. — Statistics are herewith presented which show that the number of women engaged on the Class 1 railroads on January 1, 1919 was 99,737 as compared with only 81,803 on October 1, 1919. — L. A. Shaw.

Children Leaving School for Work. School and Society, July 10, 1920, 12, No. 289, 48–49. — The Children's Bureau of the United States Department of Labor reports that one million children between the ages of 14 and 16 leave school each year in the United States. Only a few children receive any help from their parents in finding suitable work, because parents do not have the necessary information and experience. More than nine-tenths go into "blind-alley" jobs. Many drift, and many find work for which they are mentally or physically unfit. What is needed is more organization in the schools, or in close connection with the schools, since vocational guidance is best conducted in this way. Any scheme for placement and supervision of working children should include provision for further training through compulsory day-time continuation classes. — G. E. Partridge.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

Shop Lighting. *K. A. McIntyre.* Pub. Health Jour., June, 1920, No. 6, 266–274. — This is a reprint of a paper read at the Annual Meeting of the Ontario Safety League at Toronto in April, 1920. Estimates of the percentage of industrial accidents attributed to improper illumination range from 23 per cent. upwards. Good lighting stimulates production in the following ways: increased production for same cost; greater accuracy in workmanship with consequent reduction of spoilage; reduced accident hazard; avoidance or at least reduction in eye strain; surroundings made more cheerful; work performed with less fatigue; order, neatness and sanitation promoted; superintendence rendered more effective. All this can be obtained by annual expenditure of less than 1 per cent. of the payroll.

The requirements of natural and artificial lighting are the same: *viz.*, sufficiency under all conditions; diffusion, i.e., the avoidance of glare and of extreme contrasts of light and shadow; maintenance to ensure the conditions contemplated in the proper designs.

Natural Lighting: (1) "Where no overtime operation is in effect 65 to 75 per cent. of the work is done under natural light. (2) Lighting codes require double intensity of natural lighting over artificial lighting because light coming to the eye in daylight from all the surroundings is much brighter than at night; thus a more intense light is required on the work. (3) Light should be adequate for each employee. (4) Windows should be so spaced and located that daylight conditions are fairly uniform over the working area. (5) Intensities of daylight should be such that artificial light will be required only during these portions of the day when it would naturally be considered necessary. (6) Quality of light should avoid glare due to sun's rays or light from the sky shining directly into the eye. Window shades or awnings should be provided where necessary to this end. (7) Ceilings and upper portions of walls should be maintained a light color to increase effectiveness of lighting. (8) Among the special means of improving natural lighting may be mentioned saw-tooth roof construction, skylights and the use of prismatic glass to redirect light into the working space. (9) Wire glass should be used as safeguard where there is danger of glass falling if broken. (10) Some factory laws require the use of clear glass in lower sections of windows to allow employees to exercise long range vision to retain that power. (11) Windows should be cleaned regularly at proper intervals."

Artificial Lighting: (Only electric lighting considered.) Twenty-five to thirty-five per cent. of work is performed under artificial lighting. The first requirement is sufficiency. Intensity will be determined largely by the color and fineness of materials in process of manufacture. The intensities must be sufficient whether working surfaces are in horizontal, oblique or vertical planes. For an average value intensities in a vertical plane will be approximately half those in a horizontal plane of the same installation.

As regards diffusion, various considerations lead to one conclusion — general lighting from overhead. By this it is possible to keep the light source somewhat above the line of vision and to secure uniform distribution by choice of proper reflectors correctly located as to mounting heights and spacing. Drop lamps should only be used when absolutely necessary and then should be covered from view by reflectors.

Three methods of general lighting are avail-

able — direct, semi-direct, and total indirect. The first is the most suitable for factories. This necessitates the use of reflectors, either extensive, intensive, or focusing.

As to maintenance, "according to recent and comprehensive articles the best practical method involves:

"1. The use of a depreciation factor, or factor of safety in the original design of the system to ensure adequate illumination when the system has depreciated a normal amount.

"2. The cleaning of lighting units at frequent, regular intervals.

"3. The replacement of lamps which have become blackened in service by abnormally long life.

"4. The use of lamps at correct voltage rating for all replacements.

"5. The refinishing of ceilings and walls at reasonable intervals." — R. M. Hutton.

Exhaust Systems. National Safety Council, Safe Practices. No. 32, pp. 16. — One of the principal dangers encountered by workmen in many industries is the exposure to dust, gases, vapors, and fumes which are generated by various machines and industrial operations. A general classification suggestive of the more common harmful substances met with in modern industry is included in this pamphlet.

The following five methods of removing or rendering harmless dusts and fumes are suggested and discussed: (1) avoid by using wet processes or by installing automatic or closed machinery methods; (2) remove by natural ventilation; (3) remove by mechanical ventilation; (4) render harmless by isolating in a separate room or building the process or machine where the dust or fumes are generated; and (5) render harmless by requiring the operators to wear respirators, helmets, or other protective devices.

Various designs of hoods are described and illustrated, and recommendations are made as to their proper installation. Methods of disposal of dust and fumes gathered through an exhaust system are suggested. — M. C. Shorley.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

What Armco Medical Service Means. *H. H. Smith.* Personnel, May, 1920, 2, No. 5, 8–9. — The Armco Company felt that its duty to its employees should not begin and end with accidents, but that it should do everything within reason to help employees to become better citizens and happier workmen. From the sole care of accident cases, the work has been amplified to include treatment of employees for injuries or ailments beyond those coming under the state compensation law. Herein is described in detail the organization and manner of administering the company's medical and welfare service. — L. A. Shaw.

INDUSTRIAL PERSONAL AND COMMUNITY HYGIENE: HOUSING, ETC.

Housing. Housing Betterment, Feb., 1920. — Contains a useful bibliography of recent books and reports on housing and town planning and several short papers on these subjects. A recent act in England is mentioned, by which powers of the local governments in housing and town planning are increased, and financial assistance from the state, as well as direction and control by the state, are also increased. There is a useful list of economies in construction in England, comprising nineteen items. The housing situation in several countries is described. There is a summary of the town planning movement in Europe; the Garden City developments in France are mentioned; and it is stated that the city of Paris is beginning five new Garden City suburbs for workingmen. The city of Paris has recently voted to demolish its fortifications, and replace them by about 200 hectares of buildings, of which 70 hectares will be model dwellings for workingmen, and will have playgrounds and gardens. The military zone outside the walls will be turned into 450 hectares of parks and playgrounds. New societies have been founded and there are

recent laws, such as a law permitting the pooling and reparceling of property. In Great Britain the chief emphasis in town planning is placed on housing. During the war there has been almost no town planning aside from the housing and Garden Villages designed for munition workers. Since the war there has been launched a great government plan for the building of 500,000 houses. — G. E. Partridge.

Housing. Housing Betterment, May, 1920. — Contains a bibliography of about sixty titles dealing with housing and town planning. The situation in England is presented, where the shortage is said to be daily increasing. "On paper England has built 113,681 houses through its Ministry of Health to meet its housing shortage; actually the number of houses that have been constructed (511 to the end of February) is so small as to be negligible. Shortage of labor is the foremost factor in the trouble. Besides news items, there are many brief articles on a variety of phases of the housing problem: plans for financing are described, a new scheme for housing girls in New York — by the community club plan. The announcement of a university course on housing, a study of the present needs and demands, recent laws and enquiries are mentioned. — G. E. Partridge.

Your Housing Problem — II. How Small Plants Have Built Workers' Homes. Factory, June 1, 1920, 24, No. 10, 1691–1694. — This article is a review of four housing plans developed on a community basis. The plans are those adopted by the Lockport (N. Y.) Board of Commerce, the Greenfield (Mass.) Chamber of Commerce, the Worcester (Mass.) Housing Corporation, and the Williamsport (Pa.) Improvement Company. Reference is also made to the work of the Pennsylvania State Chamber of Commerce which acts in an advisory and not a financing capacity. In the four community projects finances for building were provided through the organization of housing companies to which manufacturers and other interested citizens subscribed. In Worcester, the banks play an important part in financing building by carrying first mortgages up to 60 per cent. of the cost of construction. In Lockport, five-room houses built by the Lockport Homes Company sold for $2650 a year ago; six-room houses sold for $2950. In all cases, except that of Williamsport, houses are sold on reasonable monthly payments. In Williamsport the houses were built in two, four, and six family groups which are much more adapted to renting than to selling. By plans such as those in operation in the four communities under consideration, relatively small companies can share in and contribute toward a housing scheme, much more elaborate than they could undertake individually. — C. H. Paull.

A Real Housing Accomplishment. *H. E. Miles.* Am. Industries, July, 1920, 20, No. 12, 26. — This is a brief statement of the work being done by the Housing and Finance Corporation of Detroit. Stock in this organization is subscribed by manufacturers on the basis of the number of people they employ. Loans are granted for building operations costing from $3500 to a maximum of $6000. Supervision of construction is one of the conditions of a loan. — C. H. Paull.

INDUSTRIAL INVESTIGATIONS AND SURVEYS

Hours of Work as Related to Output and Health of Workers — Metal Manufacturing Industries. Nat. Ind. Conference Board Pub., Research Report No. 18, July, 1919. — This report summarizes the results attained through two questionnaires, the first sent out in the latter part of 1917, the second in March, 1919. "Replies were received from 1,252 establishments employing 753,561 workers. Of these, 413 establishments, employing 358,336 workers had reduced hours, and furnished data as to the effects of such reductions." The geographical distribution of the plants covered by this investigation is fairly representative of the several metal working regions of the United States.

Conclusions as to Output

For a 50-hour and a 48-hour week, in which interest chiefly centers, the evidence presented in the preceding sections is summarized in the accompanying tables.

"Among the more important facts brought out by this comparison and the preceding discussion are the following:

"1. A 50-hour week has proved efficient and

practicable in a large number of metal manufacturing establishments.

"2. A 48-hour week has proved practicable in a considerable number of establishments.

EFFECT ON OUTPUT — 48-HOUR GROUP

Output	1917		1919	
	Establishments	Per Cent. of Total Employees in Group	Establishments	Per Cent. of Total Employees in Group
Totals	*41*	*100.00*	*40*	*100.00*
Increased	5	67.1 [1]	1	9.1
Maintained	13	16.4	5	8.4
Decrease, less than proportional	4	2.9	8	21.2
Decrease, about proportional	10	9.4	14	44.0
Decrease, greater than proportional	1	0.5	3	1.5
Decrease, amount not stated	8	3.7	9	15.8

[1] Over 66% of employees in the 48-hour group were in two establishments.

EFFECT ON OUTPUT — 50-HOUR GROUP

Output	1917		1919	
	Establishments	Per Cent. of Total Employees in Group	Establishments	Per Cent. of Total Employees in Group
Totals	*66*	*100.00*	*37*	*100.00*
Increased	4	4.9	2	8.5
Maintained	28	47.8	10	12.6
Decrease, less than proportional	12	28.4	9	42.0
Decrease, about proportional	10	9.7	8	11.0
Decrease, greater than proportional	2	3.4	1	1.6
Decrease, amount not stated	10	5.8	7	24.3

"3. The piece-rate system is more conducive to current efficiency of production than is the day-rate system.

"4. There is no clear-cut line below which a reduction in hours brings a practically uniform change in efficiency of production in different establishments."

"Unquestionably, the difference in results under different hours-of-work schedules is attributable in many cases to differences in efficiency of management. On the other hand, it may be that an establishment which failed to maintain production on a 54-hour week may be quite as efficient as one which maintained production on a 50-hour week; the difference in result may be due to differences in the nature of the process, in the character of the raw material, in the type of machinery, or in the type of worker employed.

"Exact mathematical measurement of the effect of changes in hours alone is not possible. Conclusions must necessarily be drawn in a broad way. The value of this study of experience in the metal trades lies in its positive evidence that it is possible not merely for occasional and exceptional establishments but for a considerable proportion of establishments to maintain production on a schedule of 50 hours per week, and that a 48-hour week is a practicable one for a limited proportion of establishments in these industries. Whether such schedules are practicable in individual cases is a problem for the particular establishment to determine. It is obviously to the interest of employers to make a thorough study of conditions in their respective plants in the light of the evidence presented in this report."

Following this section of the report there is a brief discussion of the health of metal workers. The data presented are gathered from U. S. Census Reports, Bulletin 231 of the Bureau of Labor Statistics and somewhat similar sources. There is no actual field study of health conditions and the material presented adds nothing to former knowledge of the subject. — Cecil K. Drinker.

INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS: SPECIAL TESTS IN THE SELECTION OF EMPLOYEES

Civil Service Examination for Psychological Investigator in Employment Tests. School and Society, July 3, 1920, 12, No. 288, 14–15. — The "duties of appointees will be to study and give what are commonly known as psychological and trade tests; to devise and evaluate new tests; to compile statistical reports of results, and to investigate personnel problems." — G. E. Partridge.

A New Method of Rating Teachers. *W. L. Conner.* Jour. Educational Research, May, 1920, 1, No. 5, 338–358. — The author proposes a card for rating teachers according

to the results they obtain from their pupils. Five classes or standards are recognized: inferior, below average, average, above average, and superior. The function of the teacher is analytically expressed in the following terms:

The teacher — personal appearance, character, education, social efficiency;

The government of the school — assignments, morals in the despatch of assignments, freedom to initiate social activities, elimination of anti-social conduct;

Instruction as providing for educative activities, thinking, emotional reaction, acquisition of knowledge and skill, deportment;

The teacher's attention to health and comfort of pupils, play and social life of pupils, grounds, buildings, equipment and supplies, professional ethics.

Using this system as a first method, further study of the factors entering into teaching was made, and the plan of rating modified accordingly. — G. E. Partridge.

A Constant Error in Psychological Ratings. *E. L. Thorndike.* Jour. Applied Psychology, March, 1920, 4, No. 1, 25–29. — Science seems to demand that in all work on ratings for qualities the observer should report the evidence, not a rating, and the rating should be given on the evidence in each quality separately, without knowledge of the evidence concerning any other quality in the same individual. — G. E. Partridge.

What Industry Wants and Does not Want from the Psychologist. *E. Frost.* Jour. Applied Psychology, March, 1920, 4, No. 1, 17–24. — The author enumerates thirty-four types of proposal that have been made for the betterment of industry. This useful list comprises: Americanization of the alien, establishment of bonus systems, better housing of employees, universal continuation schools, increasing efficiency through diet, daylight-saving laws, efficiency engineering in factories, the establishment of foreman's classes, find-yourself campaign for working boys, graded wage scales, compulsory health insurance, industrial democracy systems, special legislative enactments, morale work, diagnostic motion pictures in the shop, nationalization of basic industries, national board of community speakers, psychological tests, questionnaires, personnel ratings, systematic propaganda, recreational athletics, rest periods and fatigue studies, restriction of immigration, shop committees, employment management, socialism, revision of the metric system, excess profits and other taxation, thrift campaigns, unionism, vestibule schools, vocational guidance, and welfare work.

The unrest following the war has emphasized a new set of problems, the main ones being: unionism, labor turnover, selection and training of foremen, education of the alien, wage and hour adjustments, housing, working conditions, and, in some states, health insurance, taxation and continuation schools. Four of these problems have special psychological implications: (1) labor turnover; (2) Americanization; (3) the continuation or part-time school; (4) the problem of the foreman. — G. E. Partridge.

The Present Attitude of Employees to Industrial Psychology. *Susie S. Brierly.* Brit. Jour. Psychology, March, 1920, 10, Nos. 2 and 3, 210–227. — This article, written from the standpoint of social psychology, analyzes the effects upon the attitude of workers resulting from the widespread interest in and introduction of psychological methods into industry. Although it is by no means easy to understand precisely what the attitude of the workers is, on the whole it is one of opposition to the new ideas. On the side of the scientific worker there is much misconception because he has adopted and cherished the abstraction of the economic man as representing the industrial unit. We think too much in terms of wages and hours, and of increased production. Instead we must approach our problem on the broadest human basis.

At the present time the worker is suspicious of the motives actuating the attempt to change industrial practices. He fears also that unemployment will result automatically from scientific industry; and this fear becomes a social and ethical state of mind. He does not believe that the whole labor world can benefit permanently from the innovations. The worker sees in the new movement, too, still further mechanization of work, still further reduction of personality and human dignity in it. The future of individual craftsmanship is questioned. The error consists in the worker's not perceiving that scientific methods do not create the tendency toward specialization, but the objection is deep-seated; men deeply desire to make their daily work a true vocation. To meet the objections of the workers, and to determine the normal and best conditions is a

work that falls especially to psychology as the study of the whole man in all his social relations. — G. E. Partridge.

Employment Psychology in the Rubber Industry. *H. E. Burtt.* Jour. Applied Psychology, March, 1920, 4, No. 1, 1–17. — This is an interesting report of a "consulting psychologist's" work in a Canadian rubber company, mainly in perfecting tests for the use of the employment office. After some preliminary work, vocational ratings were made of a large number of workers in the factory by foremen and inspectors. Of the two current methods in making vocational tests, that of duplicating in miniature so far as possible the work or the mental situation involved, and that of analyzing and testing the mental abilities engaged in the work, the latter was preferred. The tests were given by means of mimeographed blanks to a group of people simultaneously, using thirty-two tests drawn from various sources and covering a wide range. There were also individual tests — adaptations of conventional tests as given in the manuals. Then tests were selected for each operation to be studied, given to workers of all degrees of ability, and each test score correlated with the vocational rating. "The most promising tests were retained, the coefficients corrected for attenuation, partial correlations computed and the regression equation derived in order to weigh the tests and get the best possible prediction for vocational ability. After determining the correlation of combined weighted scores with the criterion, a table was made with deciles of combined weighted test scores tabulated for deciles of probable vocational success. It was thus possible to predict from the test scores the probability of an applicant's being in the highest tenth, next highest tenth, etc., of workers in a given operation. These methods were applied to a number of rather specialized operations — finishing, treading and building tires, handing out stock, and clerical work. . . ." For less specialized factory operations a general intelligence scale was devised. — G. E. Partridge.

Percentiles for Certain Tests of Aptitude. *E. Claparède.* Archives de psychologie, Dec., 1919, 17, No. 68, 313–324. — Percentiles are worked out for tests of memory for words, permutation tests, rapidity of writing and calculation. Results are given for adults and for children. The author thinks the permutation test measures intelligence as shown in inventiveness. — G. E. Partridge.

The Constancy of Individuals with Regard to Tests of Aptitude. *E. Claparède.* Archives de psychologie, Dec., 1919, 17, No. 68, 325–334. — The results show the existence of individual aptitudes having a certain constancy. The correlations are high, but insufficient for the purposes of individual psychology. — G. E. Partridge.

The Applicability of Mental Tests to Persons over Fifty Years of Age. *Josephine C. Foster* and *Grace A. Taylor.* Jour. Applied Psychology, March, 1920, 4, No. 1, 39–58. — From these studies made by the Yerkes-Bridges point scale, the following conclusions are drawn: (1) There are certain definite changes in the distribution of scores on the point scale as the chronological age of the subject increases; (2) these changes are evident in both normal and psychotic persons; (3) there are three probable reasons for the changes — loss of ability, lack of practice, and absence of alertness or of interest; (4) the mental condition of a subject over 50 years of age will be much more accurately presented if two mental ages are given, one which compares him with his own adolescent ability (or with that of normal young persons), and one which compares him with his normal contemporaries. — G. E. Partridge.

Psychological Tests as Diagnostic of Vocational Aptitudes in College Women. *Elsie Murray.* Jour. Applied Psychology, March, 1920, 4, No. 1, 30–38. — The writer tried to extend some routine tests in order to throw light upon practical abilities of students. The tests comprised three series: (1) tests of controlled association, logical memory, completion, proverb matching, generalization, information, etc.; (2) rote memory, rote learning, addition, spelling, cancellation, easy directions and related tests; (3) tests of motor dexterity, alertness to surroundings, etc., such as tapping, card sorting, construction puzzle, weight suggestion, divided attention, etc. . . . A fourth or "social ability" set of tests was added, including a series involving judgments upon personal attributes, situations, and facial expression of the emotions. Thus general intelli-

gence (or teaching ability), accuracy (or clerical ability), practical ability, and social ability were measured roughly at least. There is decided dissimilarity in the four functions measured. Comparison of the student's own vocational choice with the various test scores reveals a fairly high degree of correlation between individual ambition and experimental findings. The article contains a bibliography of thirty-five titles. — G. E. Partridge.

Test Interpretation. *S. D. Porteus.* The Training School Bulletin, June, 1920, 17, No. 4, 68–72. — Reports a study of correlations of gradings of industrial ability, educational attainments and degree of social fitness made by a teacher, with results of the army tests, the Binet tests and the Porteus tests, applied to a group of children. The highest correlation was obtained by the use of the Binet and the Porteus tests together. — G. E. Partridge.

INDUSTRIAL SERVICE AND MUTUAL BENEFIT ASSOCIATIONS

Welfare in the Land of the Rising Sun. Am. Industries, Aug., 1920, 21, No. 1, 21–22. — A brief account is given in this article of social and medical work carried on by a large textile company in Japan. Among the facilities offered to employees are:

1. Schooling for men and women
2. Plant papers
3. Dormitories
4. Houses for married workers or a rent subsidy where houses cannot be provided
5. Lunch facilities
6. Clothing at cost
7. Fully equipped hospitals with departments of medicine, surgery, ophthalmology, obstetrics, and dentistry. These facilities are available to workers and to members of their families
8. Extensive recreation facilities. — C. H. Paull.

Welfare Work in a Japanese Electric Plant. *George M. Price.* Mod. Med., March, 1920, 2, No. 3, 235–237. — This descriptive article is based upon the author's correspondence and also upon remarks made by members of the recent International Labor Conference. *The Modern Factory*, by G. M. Price, has been translated into Japanese. Certain large companies have instituted welfare features, recreation, recuperation and housing, and the education of children. Photographs showing some of the sanitary and protective measures in use at the plant of the Tokyo Electric Light Co. are reproduced. These pictures show a fire drill in progress, the plant fire brigade, parts of the plant hospital, a ventilation system, and a lathe worker using a dust respirator, all of which indicate that an excellent beginning is being made in Japan in industrial hygiene and welfare work. — L. Greenburg.

Restaurant Facilities for Shipyard Workers. *Frederick S. Crum.* Mod. Med., Feb., 1920, 2, No. 2, 138–141. — The value of restaurant facilities for industrial workers is emphasized. A brief description is given of the equipment necessary for the establishment of industrial restaurants and of the requirements which must be met in order that the restaurant project be a success. In the discussion of these requirements, convenience of location, attractiveness, prompt service, hours, food, prices, payment, and management are considered. — L. Greenburg.

Vacation Arrangements that Don't Upset Things. Factory, May 15, 1920, 24, No. 9, 1550–1552. — This brief article should be of particular interest because of the novelty of one of the plans which it presents and because of the bearing of this plan upon the health of an entire working force. During the summer the Autocall Company closes its entire plant for a vacation period. With the exception of the general manager and a stenographer, everyone is on a vacation. Preparation for the closing of the plant is begun as far ahead of time as possible. Surplus production is secured where possible and feasible. During the vacation only urgent correspondence is attended to in the office. In the case of all other correspondence a printed form is sent to the writer explaining why his letter is not being answered, and stating the time when the office force will return to its duties. — C. H. Paull.

Workers' Benefit Plan Recently Adopted by the Curtis Publishing Company. Personnel, Sept., 1920, 2, No. 9, 2–3. — The most important regulations of the new Employees' Benefit plan recently adopted by the Curtis Publishing Company are herein given. — M. C. Shorley.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

National Labor Legislation. Bull. International Labour Office, 1918, 13, Nos. 1–10, printed Oct., 1919. — These bulletins contain summaries of recent national labor legislation in Germany, German Austria, Bulgaria, Spain, France, Norway, Russia, and other European countries. In regard to Germany, several interesting items are given, such as orders concerning provision for the unemployed, concerning the extension of compulsory insurance and the right to insurance under the sickness insurance system, orders regulating the hours of work in baking and confectionery establishments and providing for an eight-hour day for industrial workers, and orders regulating the conditions of work and wages in home work, and of child labor, with special reference to boys and girls under fourteen years of age. In Bulgaria there are new regulations concerning the health and safety of workers, and governing the admission of children to industrial and commercial work. In Spain an act has been passed requiring an uninterrupted rest period of twelve hours every day in all commercial work. From France there is a long list of decrees applying to liability for industrial accidents and for protection against alcoholism, and an act to organize the Saturday half-holiday for women in the clothing trades, etc. Norway reports an act making detailed provisions respecting industrial work. From Russia there is a report of a decree of the Central Executive Committee of the Soldiers' and Workers' Representatives concerning the eight-hour working day and the distribution of working hours. — G. E. Partridge.

Abstracts of Committee Reports, Annual Convention of National Association of Manufacturers. Am. Industries, June, 1920, 20, No. 11, 16–17. — Among the reports is one on workmen's compensation laws. The following are given as essential requirements for the efficient and proper administration of workmen's compensation laws:

1. Absolute financial security to the manufacturer;

2. Reduction of losses to a minimum through prevention of accidents;

3. Reduction of duration of disability through efficient medical services and rehabilitation of the injured employee;

4. Prompt and impartial service in determining the amount and in the payment of benefits prescribed by the Workmen's Compensation Act in the state where operating;

5. Maximum economy of expense;

6. Minimum interference as between employer and employee in the making of payments under the law and in the settlement of claims.

The Committee on Industrial Betterment, Health and Safety declared its opposition to compulsory health insurance. It also recommended that as far as possible housing should be made a community matter rather than be left as a burden wholly on the shoulders of industry. — C. H. Paull.

Lead Poisoning and Compensation. Lancet, May 1, 1920, 198, No. 5044, 970–971. — This is a brief discussion of a decision at the Holt County Court upon a claim for compensation under the Workmen's Compensation Act — a claim demonstrating the difficulties which may arise in cases of alleged lead poisoning. The medical evidence, while in harmony as to the existence of lead ingestion as a toxic factor at one period in the patient's history, differed over its bearing upon the neurasthenia and disordered action of the heart present at the time of trial. — K. R. Drinker.

Comparison of Canadian Workmen's Compensation Laws. *Carl Hookstadt.* U. S. Bur. Labor Statis., Month. Labor Rev., March, 1920, 10, No. 3, 171–180. — With but one exception all of the Provinces of Canada, including the Dominion Government, have enacted workmen's compensation legislation. This article reviews these laws, comparing them with workmen's compensation laws in the United States. — L. A. Shaw.

Workmen's Compensation for Occupational Diseases. Nat. Civic Federation Rev., April, 1920, 5, No. 2, 10. — A bill introduced into the Senate and Assembly providing for compensation for occupational diseases. — G. E. Partridge.

Notices and Claims under Compensation Acts — III. *Chesla C. Sherlock.* Am. Machinist, April 15, 1920, 52, No. 16, 844–846. —

In concluding this series of articles, the author discusses the matter of attorney's and doctor's fees and shows the attitude of most compensation commissions in protecting both employer and employees from exorbitant fees. — G. M. Fair.

Minimum Requirements in Compensation Legislation. *Royal Meeker.* U. S. Bur. Labor Statis., Month. Labor Rev., Nov., 1919, 9, No. 5, 280–293. — A paper read at the sixth annual meeting of the International Association of Industrial Accident Boards and Commissions, held at Toronto, Canada, Sept. 23–26, 1919. The writer discusses his subject under the following headings: *Is Uniformity Desirable and Feasible? The Purposes of a Workmen's Compensation Law; Coverage; Occupational Diseases and Poisons; Insurance; Waiting Period; Medical Benefits; Money Benefits; Administration; Accident Reporting and Statistics.* — R. B. Crain.

The Relative Merits of Different Compensation Insurance Systems. *Carl Hookstadt.* Am. Labor Legis. Rev., March, 1920, 10, No. 1, 15–24. — The writer applies the test of security and service to the several types of workmen's compensation insurance known in this country. These types are: (1) private insurance carriers, either stock or mutual; (2) competitive state funds; (3) exclusive state funds; (4) self-insurance.

In discussing the element of security as it is related to these four types of insurance, it is pointed out that in the case of stock insurance carriers two elements are involved: (1) adequate insurance rates, and (2) adequate reserves. In the case of the mutual carriers the same provisions apply, though from the standpoint of the employee greater protection is furnished, inasmuch as employers insured in mutual companies are subject to assessment when the losses exceed the premiums. There are now in existence eight exclusive state funds and nine competitive state funds. The writer recommends that provisions as to rates and reserves be applied as rigidly to state funds as they are to private companies. Although no state fund as yet has become insolvent, some of them provide payment to claims only while the fund exists. Except in the states where exclusive state funds exist provision is usually made for self-insurance. In some states self-insured employers are required to furnish proof of their solvency or provide security. Although self-insurance seems to have worked satisfactorily, the writer feels that sufficient security is not provided in some cases at the present time. Self-insurance should, in his opinion, be "subject to the same supervision and regulation as to security and reserves as those imposed upon regular insurance carriers."

In discussing the element of service, attention is called to the following principal tests: accident prevention, just compensation awards, promptness of payment, minimum of time and expense in adjudicating contested cases, aid given claimants in obtaining their compensation, medical aid and supervision, and care of permanently disabled.

In connection with the question of just awards, three causes are indicated as leading to non-payment or underpayment of benefits: (1) lack of proper government supervision and administration; (2) ignorance of employees as to their rights; (3) dishonesty on the part of the employer or the insurance carrier. In New York State it was found that in an analysis of 1000 cases selected at random 114 were underpaid. The guilt for this underpayment seems to have fallen particularly at the door of private stock companies and self-insured employers. In order to reduce underpayment to a minimum, certain precautionary steps should be taken: (1) An authoritative commission should be established to administer the compensation act; (2) this commission should receive promptly reports of all compensable accidents; (3) all fatalities and doubtful cases should be investigated; (4) care should be taken to see that injured employees understand their rights under the law, and have an opportunity to present their version of the accident.

In taking up the question of promptness of payment it is pointed out that the worker should begin to receive compensation as soon as possible after the accident. Promptness may be facilitated by a thorough and business-like investigation of claims. In a recent investigation of the relative promptness with which compensation claims are paid under different types of insurance it was found that "the stock companies have the least creditable showing and the state fund the most creditable." — C. H. Paull.

Group Insurance as Employees' Service. *Edward E. Rice.* Indust. Management, June,

1920, 59, No. 6, 449–453. — "Group insurance," writes Mr. Rice, "is not . . . an instrument provided solely to reduce labor turnover expense. . . . It is rather the medium through which employer and employee may coöperate to the advantage of both in raising the standard of living and working conditions in the industry." The employer's interest is in no wise paternalistic, but has the same basis as that which prompts him to provide wholesome working conditions.

While a great deal has been done to improve the physical condition of the worker on his job, relatively little attention has been paid to the mental states which may affect him, and through him have a bearing upon production. The worker should be relieved as far as possible of worries such as those arising from the possibility of loss of income to his family through illness, accident, or death befalling him.

The employer's interest in group insurance has a certain tangible financial measure. When a worker stays on a job or in the employ of a firm for a considerable time, he is saving for his employers the sum of money which would be required to break in a new worker. It is suggested that this saving become the basis for the employer's payment toward a group insurance fund. In answer to the criticism that this money should be paid to the worker as wages and the question of insurance left entirely to his volition, the writer points out that the average worker of today has not reached the point where he appreciates the value of insurance. He would not insure himself if the group opportunity were not afforded him.

There are three major divisions of group insurance:

1. Group disability insurance — "Compensation to the worker for loss of time due to sickness and accidents not already provided for under compensation acts."

2. Group life insurance — "Compensation to the worker's family for loss through death while in service."

3. Group annuities — "Compensation to the worker due to old age incapacity or total incapacity before reaching the retirement age."

In administering group disability insurance the writer recommends that payments be made to disabled workers on the basis of fixed daily amounts rather than on the basis of a percentage of wages.

In the discussion of group life insurance, it is recommended that the idea be presented to the workers in a plant through a committee of their fellows. In this way the idea will receive the criticism and final sanction of a representative body of the workers themselves.

In a plan recently advanced by insurance companies, annuities beginning at a predetermined age may be provided for by the setting aside with insurance companies of a sum each year to cover these annuities. The employer is protected from excessive burden by such provisions as the pension age, and a specified term of service before an employee becomes eligible to old age pension protection.

In concluding, the writer calls attention to the Westinghouse plan, by which group insurance has been made a means toward stimulating thrift through systematic saving. — C. H. Paull.

Recent Progress in Social Insurance throughout the World. *Olga S. Halsey.* Am. Labor Legis. Rev., June, 1920, 10, No. 2, 151–154. — The writer presents a brief review of social insurance legislation recently enacted. New health insurance legislation was provided in 1919 in Portugal, Czecho-Slovakia, and Poland. Social insurance legislation has been amended in Great Britain, Norway, Germany, and Austria.

In Portugal health insurance is made compulsory for persons between 15 and 75 years of age who work for less than a specified amount. In Czecho-Slovakia health insurance legislation applies to all persons (except public employees) who work for wages, regardless of the amount. Among the benefits of the act are free medical care (including obstetrical services), 60 per cent. of wages for thirty-nine weeks in case of illness, a maternity benefit of 60 per cent. of wages.

New legislation covering compulsory old age insurance has been enacted in Italy, Spain, Portugal, the United States, Uruguay, and Czecho-Slovakia. In the case of the last-named country, the insurance applies only to salaried employees. In Italy the income for the old age insurance comes from equal contributions made by the employers and employees and by the state. In Portugal employers are assessed 6 per cent. on all wages paid below a certain amount, insured workers are assessed $1\frac{1}{2}$ per cent. on their wages, and the state furnishes certain subsidies. In Spain

employers and the state make the first contributions toward old age insurance; workers begin to contribute after a certain initial period.

Unemployment insurance legislation has been greatly stimulated by conditions growing out of the termination of the war. Among the countries which have provided for the unemployed through government grants are Great Britain, Belgium, Germany, Austria, and Czecho-Slovakia. — C. H. Paull.

INDUSTRIAL MORTALITY AND MORBIDITY STATISTICS

Disability by Age and Occupation. *Boris Emmet.* Mod. Med., Sept., 1919, 1, No. 5, 379–384. — To arrive at the actual extent of sickness among wage-earners, the United States Bureau of Labor Statistics made an intensive actuarial examination of the disability experience of the Workmen's Sick and Death Benefit Fund of America, a mutual sick and death benefit association, in existence since 1884, and operating on a national scale. The society confines its disability membership almost exclusively to male wage-earners, eighteen years of age and over. The disability experience examined represents the average annual sickness for the five-year period ending December 31, 1916, and is, therefore, free from accidental variations such as, for instance, those caused by the Spanish influenza epidemic of last year. The disability experience of 40,000 wage-earners in forty-two occupations is recorded. It was found that the average number of days lost for all occupations was 6.61 days each year. Certain occupations (miners and freight handlers) had a disability rate as high as 9.7, while others (professional men) had as low a rate as 2.6 days each year. It should be noted, however, that some of the highest disability rates are partly due to the inclusion of industrial accidents which were particularly heavy among such occupations as mining and freight handling.

"The conclusion is unmistakable that there is wide variation in the amount of sickness borne by workers in different occupations. Freight handlers, for instance, suffered 47 per cent. more than the average, although the average age of this group was three years less than the average age of the total. At the opposite extremes the professional workers suffered 56.1 per cent., jewelers, 43.9 per cent., and trade and clerical workers 30.3 per cent., less than the average. Comparisons, of course, must take other elements into consideration. The living conditions of different groups are different. The intelligence of the groups varies. The wages and consequent ability to obtain a decent living varies and the hours of work are also different. But it can readily be seen by measuring certain occupations with other occupations in which conditions are very similar that the factor of occupation is a steady one as a cause of sickness." — C. K. Drinker.

Duration of Wage Earners' Disabilities. *Boris Emmet.* U. S. Bur. Labor Statis., Month. Labor Rev., March, 1920, 10, No. 3, 4–15. — The present study was undertaken for the purpose of revealing the duration of disability as influenced by age and occupation. The figures are for the years 1912 to 1916, inclusive, and represent the experience of the Workmen's Sick and Death Benefit Fund of the United States of America. Disabilities resulting from accident as well as those caused by sickness are included. Tables are given to show: (1) the duration of disabilities among wage-earners; (2) the influence of age upon disability; and (3) the effect of occupation upon disabilities. — L. A. Shaw.

ABSTRACT OF THE LITERATURE
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GENERAL

THE HYGIENIC CONTROL OF INDUSTRY IN THE PERIOD AFTER THE WAR. *Alfonso di Vestea.* Il Lavoro, May 31, 1920, 12, No. 1, 7–11. — Di Vestea considers the special evils of war-time industry under four heads: first, a serious deterioration of the population with a greatly increased proportion of invalided, blind, lame and mutilated; second, an increase of epidemic diseases, notably tuberculosis and malaria; third, an increase of vicious habits, abuse of alcohol and tobacco, and sexual indulgence; fourth, labor carried on under great stress resulting in exhaustion and in a greater frequency of accidents.

Before the war the population of Italy had already been impoverished by the emigration of young men, especially in the southern provinces where the resulting over-proportion of women to men reached 374 to 292 in Abruzzo-Molise, in the year 1911. The war has of course greatly increased this unnatural condition, and particularly in those very provinces where emigration had already left its mark. The author emphasizes the necessity for legal safeguards for women and children in industry if the population is to be made normal again, the protection of pregnancy, of the puerperium, of infancy and childhood. Physical education must be carried on in the schools and the crusade against tuberculosis supported. All such measures are needed most in the south where malaria is endemic and where, according to the figures of 1911, the expectation of life is far below that in the provinces of the north and center. In Puglie it is only 44 years and 8 months as against 54 years and 9 months in the center.

The housing situation calls for urgent reform, and this should take precedence over such measures as the eight-hour day, for though shorter hours are a benefit if the workman's home is healthful and pleasant, they may be the contrary if this is not the case. The experience of

physicians in the mercury mines of San Salvatore dell' Amiata showed that when the working day was shortened in order to diminish mercurial poisoning among the miners the result was most disappointing; mercurialism was actually increased because the miners, unwilling to spend their leisure in their squalid, crowded homes, spent it in the wine shops. — A. Hamilton.

THE NECESSITY FOR AN INSTITUTE OF INDUSTRIAL HYGIENE. *Charles Baskerville.* Mod. Med., May, 1920, 2, No. 5, 363–364. — "Progress in chemical industries must of necessity carry with it a parallel improvement in the hygienic conditions of chemical workers, where the relation of disease to occupation has been established. It should not, however, be necessary for each separate industry to discover right conditions for their men, for trial and error in this field cost in health and human welfare. An endowment must be found to sponsor the co-ordination of all research agencies in chemistry, for the compilation of all data to present achievement, and for the direction of future activities."— M.C. Shorley.

OPPORTUNITIES AND RESPONSIBILITIES OF THE PHYSICIAN OF TODAY. *Frank L. Rector.* Jour. Am. Med. Assn., Sept. 4, 1920, 75, No. 10, 651–654. — A plea for a better realization on the part of the physician of the character of his responsibilities in present day medical work. Since he must in the end bear the main burden in all types of preventive medicine, he should not enter such movements as an individualistic executive agent after they have been organized and started by laymen but should be part of the driving power from their very inception. — C. K. Drinker.

THE MEDICAL AND ALLIED PROFESSIONS AS A STATE SERVICE. *D. F. Harris.* Scientific Monthly, Sept., 1920, 11, No. 3, 235–245. — There is no valid reason, other than an historical one, why the scientific cure of diseases should not be a state service as much as the scientific prevention of diseases. The Indian Medical Service affords an example of such a state-managed service, which might well be extended. Under this system promotions, disability pensions, and the like would all be provided for by regulations like those of the Civil Service. The state would take over the problem of research in medicine, and co-ordinate all efforts. Study of the history of medicine shows strong tendencies in the socialistic direction. Differentiation is taking place, and there is a growing interest in the welfare of groups or sections as distinguished from individuals: soldiers and sailors as such; boys under fourteen; those suffering from venereal diseases; prisoners; the destitute. All such as classes become special problems, and we see societies for promoting the welfare of policemen, postal officials, illiterates, immigrants, ex-convicts, etc. It is a day of "sanitarily minded humanitarianism." At the present time, it is the health of sections of the community that is the concern of governments — the health of miners, or of workers in potteries, or of wool sorters as such. We have become communistic, institutionalistic, socialistic in the best sense, and the instituting of a state medical service is entirely in harmony with the general trend of an ever-widening humanitarianism. — G. E. Partridge.

MEDICINE AND SOCIAL REFORMS. *L. Devoto.* Il Lavoro, June 30, 1920, 12, No. 2, 33–43. — L. Devoto urges the appointment of industrial physicians, with trained nurses as aids, for the prevention of occupational disease. As a field in which the need is specially great he mentions the mines of Sicily with their high rate of ankylostomiasis, a national disgrace which should be wiped out as pellagra is being wiped out. As for the latter, it did not undergo recrudescence during the war, as might have been expected, except in parts of the invaded regions where the population was obliged to subsist on a diet of spoiled maize. Physicians should realize that the appearance of a single case of pellagra is a warning that people are receiving an inadequate food supply and that measures must be taken to avert an outbreak of this disease.

Devoto looks to the newly enacted compulsory health and old age insurance law to control occupational diseases. He defends the eight-hour working day and holds that when workmen's dwellings have been reformed as they should be, there will be no increase of alcoholism as a result of the shorter hours. For certain specially fatiguing occupations, such as that of girl telephone operators, six hours are long enough. He pleads for more respectful treatment and more co-operation on the part of the public toward those members of the medical profession who are trying to bring

about hygienic and social reforms. — A. Hamilton.

Chronicles of Social Hygiene. *A. Elster.* Öffentliche Gesundheitspflege, 1920, 5, No. 2, 27–31. — Elster complains that the industrial branch of social hygiene has in recent years lagged behind the political aspects of the industrial question; the political interest is to be expected to produce better conditions in general, but positive results have been relatively lacking. He discusses the articles of the treaty (387–427) that relate to international labor organization. There are references to recent acts and statistics bearing on the frequency of sickness in several industries by years from 1913 to 1918. — G. E. Partridge.

A Physical Census in England and Its Lessons. Jour. Heredity, April, 1920, 11, No. 4, 190. — For the first eight months of 1918 the number of medical examinations conducted by the National Service Medical Boards in Great Britain amounted to 2,080,709. Of the men examined not more than 37 per cent. were placed in Grade I; that is, only about one in three had attained the normal standard of health and strength, and was capable of enduring physical exertion suitable to his age. The experience of the board examining women medically for the national works was similar to that of the National Service Medical Boards. Preventable disease is responsible for the bulk of the physical disabilities, and this is a measure of the ravages which industrial life has made upon national health. Too little food, too long hours of work, too little sleep, too little play, too little fresh air, too little comfort in the home are factors, but the defectiveness is in part due also to the habits of modern civilization that have allowed the congenitally weak to survive and reproduce their kind. — G. E. Partridge.

Material and Physical Wretchedness of Italian Fishermen. Il Lavoro, June 30, 1920, 12, No. 2, 52–54. — In 1912, Somigli published a work on the fishing industry of Italy which he showed to be enormously behind that of northern Europe in the methods employed, the wages and conditions of work, and the character of the men employed. The Italian fishing trades have undergone little if any change in centuries, and where northern countries are using machinery, steam power, etc., the Italians are still hauling their nets by hand, using primitive fishing boats, and confined in their operations to shallow waters. No progress has taken place since 1912, and Italy is largely dependent on importation for her fish supply. The condition is an absurdity, for with a proportionately larger coast line than any other European nation she pays more for fish than does inland Switzerland. Her supply comes chiefly from Basel, Hamburg, and Bordeaux. The neglect of this industry has resulted in a steady decrease in the number of skilled sailors and fishermen in Italian waters and in the persistence of outworn method of work. — A. Hamilton.

Industrial Educational Problems. Nat. Assn. Corporation Schools Bull., June, 1920, 7, No. 6. — Contains brief articles on several of the educational problems of industry. There is a useful classified list of personnel activities, an account of the Goodyear Industrial University, and of the Educational Division of the Elliott–Fisher Company. — G. E. Partridge.

The Need for Progress of Industrial Education in England. Nat. Assn. Corporation Schools Bull., Aug., 1920, 7, No. 8, 337–340. — This is a report of an address by the head of the Corporation School of Lever Brothers, in England. The main provisions of the new education bill are summarized. An employer may choose one of four different ways to meet the provisions of the bill. He may simply release the young people for the required number of hours, leaving the rest to the Local Educational Authority; he may leave the purely educational subjects in the hands of the L.E.A., and by arrangement with them provide what is called the vocational section of continued education; he may provide the school buildings, the gymnasium, club rooms, etc., and leave the educational arrangement for curriculum, teaching staff, etc., in the hands of the L.E.A.; he may provide a school of his own for his young employees — what is usually called a work school. Such a school may be entirely financed by the company, or it may be recognized by the Educational Authority and receive the government grants in the ordinary way. — G. E. Partridge.

Summary of Conclusions in Vocational Education. *J. M. Brewer.* Education, Sept., 1920, 41, No. 1, 53–57. — The members of a

class in education have tried to formulate the principles of vocational education and to present them in a brief summary. "The compulsory part-time continuation school offers the most promising agency for providing the guidance and instruction needed for boys and girls in industry; its upper range should be extended to age 18, and attendance for eight hours per week should be required. The part-time cooperative school under public control offers the ultimate, the most helpful, the most democratic, the only practical solution to the complex situation created by the imperative need for vocational education in modern life. . . . Schools in stores and factories, including vestibule schools, are supplementary and specific in character, and are legitimate expedients that may be used to provide immediate skill, but are in no sense a substitute for the more general and socially necessary education provided under public control. . . . Extension courses, dull-season courses and up-grading courses should be developed more extensively, closely correlated with actual trade conditions, and provided for adults as well as minors. Evening schools . . . will continue to be desirable. Attendance at either evening or part-time continuation day schools should be obligatory for employed miners under 18. Correspondence schools . . . should be provided at public expense. . . . Home projects should be made the basis of practically all agricultural education in intermediate and secondary schools." — G. E. Partridge.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

MENTAL

Body and Mind. *Fred. W. Mott.* Lancet, Aug. 21, 1920, 199, No. 5060, 383–387. — This is a powerful plea for the more exact study of the mental defects and characteristics of the individual, in order to gauge his worth for either a military or civil occupation.

The writer points out that the war has produced no new nervous diseases, but has only brought to light the signs and symptoms of hysteria and neurasthenia (excluding, of course, direct injury to the brain) which were latent in the person. Nervous or mental inferiority was not considered sufficiently as a cause of rejection in the army for general service, and the nation is now paying a heavy price in the matter of pensions. One-third of the unwounded in 1917, discharged as unfit for service, were men suffering from war neuroses and psychoses. A large proportion of the civil population are potential neuropaths, or psychopaths, as all experienced neurologists know, and this branch of medical training is greatly neglected, much to the nation's loss. — R. Prosser White.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

Carbon Monoxide Poisoning with Peculiar Cause of Origin. *Holtzmann.* Zentralbl. f. Gewerbehyg., April, 1920, 8, No. 4, 73–74. — The author describes two cases (one fatal) of poisoning from the evolution of carbon monoxide gas from the charcoal and organic constituents of specular iron during casting. According to Münker, gases evolved from this iron contain 19.1 per cent. carbon monoxide. Heavy atmosphere on the day of the accident evidently prevented rapid diffusion of the gas. Two other cases resulted from poisoning during the removal of the same cast iron on the following day, showing that the gas was held within the mold. — M. D. Ring.

Poisoning by Arseniuretted Hydrogen. *T. M. Legge.* Great Britain, Ann. Rep. Chief Inspect. Factories and Workshops for 1918, pp. 68–70. — "Prior to the year 1914, poisoning by arseniuretted hydrogen gas occurred chiefly in the manufacture of salts of zinc and in chemical works among workmen engaged in removing acid residue from tanks or stills by means of galvanised iron pails and metal shovels. In the years 1900–1913 isolated cases also occurred in such industries as the manufacture of wall papers and the bronzing of art metal. Cases of a similar character have continued to be reported and during the years 1914–1918 the following industries were concerned:—

Oil works, cleaning out tanks, 2 cases, one fatal.
Chemical works, cleaning out tanks, 4 cases, two fatal.
Chemical works, manufacture of zinc salts, 2 cases, one fatal.
Chemical works, zinc purification process, 2 cases, one fatal.
Brass foundry, bronzing of art metal, 2 cases.

"During the years, 1917 and 1918, increase in the manufacture of intermediate dyestuffs has led to a series of other cases, five in number, with 2 deaths; and the probable extension of this industry adds to their importance. The processes implicated have been those in which zinc dust and hydrochloric acid are used either together in a reduction process or the acid added, at a later stage in the manufacture, as a solvent for the zinc hydrate, formed at the previous stage, and any unconverted metallic zinc. When the first cases were investigated, question arose as to the possibility of hydrogen being liberated from an alkaline solution, but subsequent investigation proved this beyond doubt.

"The occurrence of these cases of arseniuretted hydrogen poisoning has been due, in some measure, to the high arsenic contents of the acid used during these years. One of the fatal cases occurred on a plant (zinc purification) which had been in operation for 20 years.

"The risk of poisoning may in the future be minimised by the use of de-arsenicated acid, but the presence of arsenic in the metal still necessitates the greatest care being exercised in any manufacture where hydrogen gas is liberated in the presence of arsenic. The cases investigated show that even when a process is carried on in the open there is danger to the workmen, or where an exhaust draught is provided for the vessel in which the reaction takes place, this precaution may, under certain circumstances, be insufficient to protect the workers. Two severe cases occurred in the manufacture of an intermediate dyestuff at a covered vessel provided with such an exhaust, where the anemometer reading taken at the manhole through which the acid was added showed an exhaust equivalent to 180–200 linear feet per minute. The explanation of such cases may be that a sudden evolution of gas, produced in some instances by a too rapid addition of the acid, neutralises the effect of the exhaust and allows the gas to escape into the face of the workman. Complete enclosure of the vessel, in which a slight negative pressure is maintained, with separate feed holes provided with valves, appears to offer the best solution of the difficulty, or where this is impracticable, *i.e.*, where a metal vessel cannot be used, an exhaust draught must be maintained at the feed holes considerably greater than that referred to above.

"The exact interval of time which elapses between exposure to the gas and the onset of symptoms is difficult to determine, owing to the absence of any distinctive physical feature by which the gas can be readily detected. The smell of garlic attributed to the gas has never been observed by any of the persons affected. Generally several hours would appear to intervene before the first symptoms manifest themselves. In one case where frothing of the contents of the vessel occurred and thus was taken to indicate the escape of gas the man employed became affected after six hours. A point of considerable interest in connection with these cases is the difference in the severity of the symptoms produced by the gas on individuals who are apparently equally exposed. Where two men were doing the same work at the same time, one was very dangerously ill, while the other escaped with no symptoms. The explanation of this phenomenon is difficult.

"The symptoms observed in the cases under review have all been classical, commencing with abdominal pain, vomiting and diarrhœa, followed after an interval of 18–24 hours by jaundice and the passing of urine discoloured by blood pigments. The six fatal cases have terminated with the prominent symptom of suppression of urine, and the length of illness in these has varied from 4–8 days. The symptoms produced by inhalation of arseniuretted hydrogen gas have hitherto been regarded as due to the action of the gas on the blood, which breaks down the red blood cells and is followed by failure, partial or complete, of the liver and kidneys to eliminate the débris. Other poisonous gases, which are known to affect the red blood cells, cause rapid death by asphyxiation, and it has been difficult to reconcile this with the slow effect of an isolated inhalation of arseniuretted hydrogen gas, although the action of the gases on the red blood cells, assuming this explanation to be a correct one, would be very different. Further light has been thrown on the phenomena observed by investigations into a fatal case which occurred in 1917.

"The post-mortem of the case did not reveal

any very striking changes to the naked eye. Some of the organs were subsequently submitted to Professor Delépine whose report showed distinct degenerative changes in the liver and kidneys. Many of the cells of the liver were found to be vacuolated, and others, chiefly in hepatic and portal zones, were pigmented; the reddish brown pigment being in the form of fine granules, none of which gave the reaction of free iron with ferro-cyanide of potassium. Vacuolation and marked degeneration were also observed in many of the secretory cells of the kidneys. The extent of the degeneration of the cells is suggested by Professor Delépine, who in his report states: 'It is possible that necrosis of the renal epithelium is more advanced than the usual histological reaction would indicate, and that the nature of the poison has altered the usual reactions of the nucleoplasm.' Analytical analysis of a portion of the liver showed that 0.01 mg. of arsenious acid were present in 200 gm. of the liver, equivalent to 0.0000878 gm. for the whole organ. These findings seem to indicate that arseniuretted hydrogen, when inhaled, produces changes in the cells of the liver and kidneys, and that the symptoms are in some measure due to these changes. Probably changes are produced by the arsenic which gains admission by the blood stream, and it may be that an organic arsenic compound is formed in the red blood cells which, when it reaches the liver and kidneys, produces changes, particularly in the excretory cells. Such an explanation would link up these cases of poisoning with cases of jaundice which occasionally occur after the introduction of arsenic compounds into the blood stream. The disparity of symptoms might be accounted for by the difference in the media concerned, the one being arterial and the other venous blood, the presence of the oxygen compound being possibly an important factor in the formation of the toxic arsenic compound.

"Estimation of the arsenic in the urine of two cases of poisoning . . . showed in one case the presence of 790 mmg. of arsenious acid in 100 c.c. of urine on the sixth day after onset of symptoms, and in the other 35 mmg. in 100 c.c. on the eleventh day. Neither of these cases proved fatal. Examination of the urine of men apparently unaffected and engaged on a process which exposes them to the risk of inhalation of arseniuretted hydrogen gas has been carried out, without, at present, any definite results being obtained, the quantity found, under 10 mmg. per 100 c.c., being regarded as without significance. It is proposed to carry the examination further and the results obtained may throw light on the cumulative action of the poison. This, if proved, would help to explain the different effects of the gas on individuals apparently equally exposed to a sudden excess.

"Periodic examination, however, of the urine of the men engaged on processes involving exposure to the inhalation of arseniuretted hydrogen gas is unlikely to prove of much value as a preventive measure. Excretion of an excess of arsenic in the urine may be an indication of the ready elimination of the metal from the system preventing a cumulative effect, or on the other hand, as seems more probable, from the results of the examination of the urine of those severely affected, the elimination of arsenic is high where the excretory cells have been damaged, that is, when the symptoms have developed. Safety in working such processes, therefore, depends at present upon the efficiency of the measures taken to prevent the escape of the poisonous gas."

Poisoning with Hydrogen Sulphide. *Tauss.* Zentralbl. f. Gewerbehyg., April, 1920, 8, No. 4, 74. — In six instances men cleaning vats in which leather had been left in water to soften were immediately overcome by hydrogen sulphide gas. Two fatalities occurred under the same conditions. The source of the poisonous gas lies apparently in the solution of organic substances of the skins together with preservatives with which they have been treated.

A similar accident befell three men cleaning a kettle in a nutrient fat factory, presumably from the formation of hydrogen sulphide from the sulphur of protein after the decomposition of the gelatinous materials. In this instance two of the cases were fatal.

The author suggests preliminary ventilation and removal of gases by steam as preventive measures. — M. D. Ring.

The Toxicity of Picric Acid. *F. Koelsch.* Zentralbl. f. Gewerbehyg., Nov., 1919, 7, No. 11, 185–187; Dec., 1919, 7, No. 12, 223–228. — Earlier writers disagree as to the toxic effects of picric acid. It has been stated that like most nitro compounds it has the tendency to decompose the formative elements of the blood with production of methemoglobin. Lowering of the red blood count and simultaneous leucocytosis have also been attributed to it. Later writers

have stated that the blood is unchanged. Independent of the blood action is the possibility of the production of convulsions through stimulation of the central nervous system. A third possible activity lies in the extraordinarily great protein decomposition which takes place in acid solution, *i.e.*, in organs where an acid reaction obtains as in the gastro-intestinal canal and kidneys where necrotic tissue changes can appear.

The general symptoms are fever, headache, dizziness, partial unconsciousness even to somnolence and collapse; inflammation of the skin and mucous membranes, jaundice, erythema, rash similar to measles, scarlet fever or urticaria, vomiting and diarrhea; albumin and blood in the urine. The lethal dose is not clearly known. In therapeutics single doses from 0.2–1.0 gm. and daily doses of 0.1–2.0 gm. are taken internally. Doses from 20 to 25 gm. can be endured.

The author quotes cases described in the literature where bronchitis, cough, dyspnea and general disturbances, such as weakness and anemia, are attributed to breathing dust containing picric acid. His own experience is based on observations in many factories where there was considerable dust and smearing of the body surface of the workers. Even after a few minutes' stay in the workroom a characteristic bitter taste is detected in the mouth, and mustaches and nasal openings are stained yellow. In a relatively short time the workers exhibit the characteristic yellow or olive-green color of hair, and yellowed skin. Inflammation of both skin and mucous membranes was observed, the former especially in the hot seasons. In one case a swelling in the mouth and pharyngeal cavity, first mistaken for diphtheritic process, was observed. Severe cases of pneumonia were not directly traceable to this agency. Fairly frequent complaints of gastric disturbance were made. No action upon the reproductive organs of the numerous women examined was observed. A history of one case diagnosed as gastric catarrh and neuritis resulting from picric acid poisoning is detailed. This victim was undoubtedly hypersensitive to the acid.

The author outlines a method for the determination of picric acid in the urine or blood. He obtained positive results in one case out of six.

Prophylaxis is undoubtedly necessary. Careful avoidance of dust, protection of the body through gloves, working clothes, washing of hands with soap before meals, rinsing of mouth with tincture of myrrh, and exclusion of workers with open wounds should be insisted upon. Thorough powdering of the face before work protects against yellowing of skin; washing the face with whey is also recommended.

Dr. Koelsch concludes, however, that picric acid as used in munitions factories is a relatively harmless substance. Tolerance toward it is very extensive unless there is a pronounced sensitivity. He has never observed cases of acute or chronic poisoning. Such transitory symptoms of irritation as may appear are easily avoided by good management of the industry and by care and personal cleanliness on the part of the workers. Special hygienic provisions are apparently not necessary. — M. D. Ring.

Acute Methyl Alcohol Poisoning. *Raphael Isaacs.* Jour. Am. Med. Assn., Sept. 11, 1920, 75, No. 11, 718–721. — The author concludes with the following summary:

"1. Wood alcohol appears to vary in its toxicity to different individuals.

"2. The symptoms are those of depression of the medulla and the cranial autonomic system and at times the sacral. There is usually a marked and early effect on vision.

"3. There is a rapid disappearance of the symptoms (unless the anatomic injury is beyond repair) with intensive alkali therapy.

"4. Many of the toxic symptoms probably accompany the acidosis, which may be associated with the acid production (formic) and with methemoglobinemia." — C. K. Drinker.

Mercurial Poisoning. *T. M. Legge.* Great Britain, Ann. Rep. Chief Inspect. Factories and Workshops for 1918, pp. 70–72. — "The figures for mercurial poisoning show an increase in the years 1916 and 1917 — caused by the greatly increased use of fulminate of mercury in filling detonators. Only a few of the cases from this cause, however, show the recognised symptoms of mercurial absorption — salivation, tremor and 'nervousness.' The great majority were cases of dermatitis or eczematous ulceration of the face, neck, hands and forearms, associated with conjunctivitis and inflammation of the nasal and laryngeal mucous membrane. The finer the powder the more irritating it is to the eyes and nostrils. The condition is very quickly set up — the reports on the cases frequently showing as short a time of employ-

ment as two or three weeks. The cases are but samples and there must be few who come in contact with the fine powder who do not suffer more or less from its effects. Unfortunately, the high explosive nature of the substance renders it quite impracticable to require mechanical means of ventilation, and, indeed, operations have to be conducted so carefully that no dust is visible. Use of a 10 per cent. solution of sodium hyposulphite (1 lb. to a gallon of water) aids in the prevention of the ulcers and rash, and the workpeople were directed to dip their hands in a basin containing the hyposulphite solution before breakfast, dinner, and leaving at night. Similarly, in the conjunctivitis, use of a 2 per cent. solution as an eye-wash has been found beneficial. I give below an interesting account by Dr. J. B. G. Skelton, . . . who was asked to make an intensive study of the conditions in the factory where most trouble was experienced, the amount of absenteeism and the number of cases of compensation at one time being considerable. In the last six months of 1916 the certificates numbered 345 and in the first half of 1917, 232. An interesting point brought out by Dr. Skelton is that the supply of a towel to each worker seems to have been more important in reducing incidence than anything else.

"The section is engaged upon the mixing of mercury fulminate compositions and the filling and pressing of it into percussion caps. There are 255 women, of whom 55 are employed in the mixing shed, and 200 in the machine shops. No men are employed.

"The cap composition containing mercury fulminate is mixed by hand, and in comparing this method with that of machine mixing, the manager of the cap factory stated that in his opinion the mixture was more complete and the resulting compound more stable when hand mixed, although machine mixing required fewer workers. At the beginning of the war the number of workers was suddenly increased to about 500, and the work was done in three eight hour shifts, and the management is inclined to attribute the numerous cases of rash and conjunctivitis which appeared among the workers in the early days to the general overcrowding.

"Before each mix the floor and benches are washed down. After mixing, the composition is taken to a conditioning room and spread out on trays to dry in the air till the right degree of moisture is obtained; if too dry it is sprinkled with water. The conditioned powder is next rubbed into depressions in a plate by hand. This plate is then inverted and superimposed upon another which contains empty caps, corresponding with the depressions on the first plate. The inverted plate is next tapped with a small mallet so that pellets of the composition fall into the caps. The tray of caps is next taken to the machine sheds.

"The commonest effects seen are conjunctivitis and dermatitis, including 'powder holes.' It seems curious that the eyes should be affected by the manipulation of a damp powder especially as dust in this process would be extremely dangerous and is very scrupulously guarded against, and it seems to me that at least an element in the production of eye trouble and erythema of the face must be rubbing with the hand during work. A 'powder hole' appearing at the sides of the fingers usually over the terminal digit must be accounted for by a moist sweating skin constantly irritated by the sharp crystals of mercury fulminate and the other ingredients of the powder.

"*Precautions.* — Gloves and respirators are not used in the factory and would, I think, do more harm than good. Goggles have been used but were much disliked by the girls and perhaps caused eye rubbing. A pail of sodium hyposulphite is kept outside the mix sheds for the girls to rinse their hands in before washing and a weak solution of this substance is used for bathing the eye, if affected. Obviously, in dealing with irritating powder, good washing facilities and an abundant supply of clean towels are essential and these seem to have been lacking in the past. The weekly number of towels used in the cap factory was for the week ending December 14th, 1917, 2 towels; week ending February 2nd, 1918, 26 towels; week ending March 2nd, 1918, 98 towels; week ending July 13th, 1918, 117 towels. The washing accommodation consists of 30 basins in one lavatory and 28 hot taps over troughs in the other. Towels are changed daily and washed by an outside washerwoman who has never suffered from dermatitis. Overalls are not changed until worn out.

"*Medical arrangements.* — A surgeon visits once a month and sees all suspected cases due to mercury at his house. Compensation at the rate of half wages is paid on his certificate. He gave me the following figures from his books: — March, 1918, 10 cases; April, 1918, 4 cases; May, 1918, 4 cases; June, 1918, 3 cases; July (to the 16th), 6 cases. They were all conjunctivitis or pharyngitis. He had never seen a case of mercury absorption due to fulminate, and said that the number of cases had shown a very rapid decline. He also gave it as his opinion that the highest incidence of throat troubles occurred in the winter and were not in all cases due to the powder.

"In the early days when work on fulminate was being pressed forward and three shifts were worked, the number of cases was high, but since May 22nd, 1917, when two day shifts were worked, the number began to fall, this fall being accentuated on July 31st when one day shift only was worked. Accompanying the fall in the number of cases per week is a gradual decrease in the number of employees and a steady increase in the number of towels.

"It is worth while to summarise the 208 cases of mercurial poisoning between May, 1899, when mercurial poisoning first became notifiable, and December last. The distribution is as follows: — Thermometers, 45; Fulminate in powder factories, 54; Hatters' furriers, 27; Electrical meters, 24; Felt hat industry, 19; Chemical works, 19; Water gilding, 12; Lining sweet moulds, 4; Mercury lamps, 3; Bronzing, 3; Card dressing, 3; Photo-engraving, 2; Other, 2.

"With mercurial poisoning, even more than with lead, the cases reported are merely an indication of the amount of absorption occurring among the workers. Especially is this the case in the manufacture of philosophical instruments, in which the making of clinical thermometers, generally described in the trade as 'glass blowing,' constitutes an important branch. During the war this industry was very busy, and controlled by the Ministry of Munitions. A large number of apprentices, both boys and girls, were taken on — a very desir-

able thing in view of the skilled nature of the industry, could it only be freed from risk to health. This was brought home to the manufacturers themselves when parents showed reluctance to allow their children to undergo apprenticeship, and naturally, there has been anxiety to improve the conditions of work. Already among the cases reported have been a few of these young persons, while others examined at work showed evidence of mercurial absorption. The premises in which the trade, largely centred in Clerkenwell, is carried on, are particularly difficult to improve. The consumption of gas is considerable and ventilation by mechanical means is considered to be out of the question on the ground that any draught would tend to crack the hot glass. Recently, however, improvements in the methods of manufacture hold out a prospect that danger will largely be removed in the making of thermometers. A committee of the employers is now going fully into the question of improving conditions as regards (1) ventilation, (2) cleanliness, (3) smooth surfaces for the benches, (4) periodic medical examination, and (5) cloakroom, messroom, and washing accommodation.

"Three of the cases have occurred in the manufacture of mercury vapour lamps, and three unusual cases occurred in rubbing a mixture of tin and mercury onto tins for baking sweets. The mixture is rubbed on so that the gum can be pulled off the tin without sticking. The mixture, after having been rubbed on the tins, had to be brushed and it was in inhaling the dust whilst brushing that the three somewhat severe cases were contracted. The process has now been given up.

"Another unusual case was that of melting metal ingots in crucibles in a furnace and subsequently adding an amalgam, reheating, and pouring the metal into moulds. The mercury in the total content was only between 2 and 3 per cent. Danger of mercury arose in the pouring of the metal and in the skimmings and residue from the crucibles thrown on the floor. Dr. Bridge examined 12 workers employed from a few weeks to six months, and found seven showing symptoms of absorption. Localised exhaust, and proper receptacles for the dross were called for.

"Attention was called to the risk of mercurial poisoning in the manufacture of cyanide gauze dressings and bandages, owing to the dust given off as the material is lapped. In one factory, periodic medical examination was instituted in the execution of a large order."

Studies on Industrial Mercury Poisoning. *F. Koelsch* and *H. Ilzhöfer*. Zentralbl. f. Gewerbehyg., Jan., 1919, 7, No. 1, 11–16; Feb., 1919, 7, No. 2, 17–27; March, 1919, 7, No. 3, 42–52. — Although industrial mercury poisoning was prevalent in 1885 among the workers engaged in silvering mirrors, after 1891 it was practically completely stamped out by means of energetic measures of sanitation and the substitution of silver deposits for the mercury. But from January, 1917, to the end of May, 1918, sixteen cases were reported, owing to the increased use of mercury and mercuric oxide in chemical industries.

Workers evince an individual sensitiveness to the poison; weakness, anemia, convalescence, and youth predispose toward infection, while alcoholism and even lack of personal cleanliness are factors. The mercury may enter the system either through the lungs as vapor and thence into the circulation, or it may condense in the mucus of the upper air passages and pass directly or through swallowing with the saliva into the alimentary canal. It may also be taken in as dust through the skin or by swallowing dust particles from the upper air passages. From this, there results a deposition of mercury in the liver, intestine, kidney, spleen, bone marrow and testicle. Elimination is slow, mercury remaining longest in the liver and the bones. The excretion takes place through all of the glands of the body, especially through the salivary, intestinal and gastric glands, and through liver, kidneys and sweat glands. The symptoms of poisoning are the result of active stimulation in the place of elimination, producing salivation, stomatitis, inflammation of the salivary glands; intestinal irritation, tumors of the colon; increased bile secretion, as a result perhaps of destruction of numerous blood cells in the liver; albuminuria, polyuria or oliguria, epithelial necrosis with deposits of calcium acid carbonate, cirrhosis of the kidney; and skin diseases, according to the seat of irritation.

Aside from these pathological conditions, there is a direct action of the poison on the central and peripheral nervous system, with degeneration of medullary sheath and of ganglion cells. Vasomotor nerves are also injured. Parenchymatous and fatty degeneration appear in organs with destruction of many red blood cells. Irritation of bone marrow and perios-

teum may lead to ostitis, decalcification and necrosis of the bone. Finally metabolism is affected. This is increased by small doses, but large amounts of mercury induce a lessened oxygen capacity of the cells with rapid decomposition of glycogen.

Clinical symptoms are as follows: (1) stomatitis leading to purulent gingivitis; (2) general destruction of organs characterized by somnolence, night sweats, etc.; (3) erythema mercurialis, timidity, anxiety, embarrassment, trembling of hands and tremor of tongue; (4) tremor mercurialis; cachexia, with pale sallow face, falling hair, cold extremities. Even five to six months of exposure to mercury can suffice to produce severe cases of tremor and cachexia.

The author describes methods of determination of amounts of mercury present in urine and in the air. He states that 0.4 to 1 mg. of mercury daily for a month is a sufficient amount to produce symptoms of poisoning. Of the twenty-five persons examined for the presence of mercury in the urine, 80 per cent. gave positive results. — M. D. Ring.

Arsenic Poisoning. *T. M. Legge.* Great Britain, Ann. Rep. Chief Inspect. Factories and Workshops for 1918, pp. 67–68. — "The increase of reported cases from three in 1915 to thirty in 1917 was due partly to the increased number of cases (nine), of which an account is given later, from arseniuretted hydrogen gas poisoning, but mainly from the manufacture (for purposes of chemical warfare) of arsenic trichloride by the action of sulphuric acid on a mixture of common salt and arsenic, from whence it distilled over and was condensed as an oily liquid and filled into drums. The plant was difficult to keep free from leaks, and the arsenic chloride permeated the air near the place where the men were working. The effect was to produce an intense irritation, showing itself in eczematous ulceration of the face, nose, hands and other parts of the body to which the vapour might gain access, especially those parts liable to excessive sweating. The mucous membrane of the eyes, nose, throat and bronchial tubes was attacked in the same way.

"In one case death was due to an accident in the manipulation of the apparatus which led to a burn on the leg extending from the knee to the ankle and half way round the leg, in a man, aged 46. Professor Delépine, who made the post-mortem examination, and examined the tissues, reported that death was due to absorption of arsenic. The microscopical examination of the organs showed that the heart, liver, kidneys, pancreas, and the gastric and duodenal glands were in a state of granulo-fatty degeneration. Arsenic was also found in considerable quantities in the various organs. It was impossible to determine to what extent arsenic absorption had taken place through the skin, but Professor Delépine expressed the opinion that the amount of arsenic found in all the organs examined indicated that some soluble compound of arsenic had been freely distributed through the body, in all probability by the blood and lymph. Examination of the hair and urine of other men working on the same plant showed the presence of material quantities of arsenic and indications of degenerative changes in the kidneys. Had the process been continued, further examinations of the urine would have been called for in order to determine the question of the advisability of the men continuing their employment. The symptoms of arsenic trichloride are thus shown to resemble those with which we are familiar from contact with the dusts and salts of arsenic, namely, ulceration of the skin, and quite different from those produced by inhalation of arseniuretted hydrogen gas, cases of which have particular interest owing to their unexpectedness, and are described below by Dr. Bridge. The pathological changes in the liver and kidneys, however, have a certain similarity which deserves attention.

"Two other cases of ulceration of the skin occurred in men who were manipulating sludge containing arsenic from acid coolers in the manufacture of sulphuric acid."

Ulceration and Perforation of the Nasal Septum caused by Bichromate of Potassium. *A. Ranelletti.* Reviewed from Il Policlinico, 1919, in Il Lavoro, May 31, 1920, 12, No. 1, 19–22. — During the war the author had occasion to observe cases of lesions caused by bichromate of potassium in a factory making chlorate of sodium by electrolysis. Among sixty-nine operatives, thirty-eight had ulceration of the nasal septum, six of them having complete perforation. The ulcers begin with an area of hyperemia which soon changes to a pale yellowish grey spot, roundish and fringed, about the size of the head of a pin up to a diameter of 2 cm. Then excavation begins into the mucosa and the cartilage; finally perforation occurs, the opening being round or oval, with smooth

borders and always of a whitish yellow color. There is no attempt at repair, no hyperemic reaction; the loss of tissue is permanent. The process takes place without pain and the victim is often unaware that he has a perforated septum, although a catarrhal rhinitis may precede it. Such a rhinitis usually comes on after about a month or two of exposure, and in a few weeks more ulceration sets in. Perforation may be complete after a few months' employment. The cause is the inhalation of chrome dust which is carried by the inspired air against the septum of the nose. There are several occupations in which workers are exposed to such dust: the mining of chromate ores, the metallurgical extraction of the same, and the manufacture of chrome colors, of Swedish matches, etc. As preventive measures are recommended the control of dust so far as possible and the plugging of the nostrils with tampons of gauze impregnated with salicylic acid. — A. Hamilton.

A Method for Manganese Quantitation in Biological Material Together with Data on Manganese Content of Human Blood and Tissues. *Clarence K. Reiman* and *Annie S. Minot*. Jour. Biol. Chem., June, 1920, 42, No. 2, 329–345. — "A method is developed for the analysis of manganese in blood and tissue which is more rapid and has fewer sources of error than methods heretofore employed." A series of results is given for manganese content of human blood for normal subjects as far as manganese exposure is concerned. Check results on the same individuals at different times show general constant level of manganese in human blood.

"A series of results for the manganese content of human tissue obtained from fourteen autopsies is presented. Manganese was found in all the tissue analyses, the liver carrying the highest amount, averaging 0.170 mg. per 100 gm. wet tissue." — A. S. Minot.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

Anthrax Problem in Massachusetts. *Stanley H. Osborn*. Am. Jour. Pub. Health, Aug., 1920, 10, No. 8, 657. — As a result of a detailed study of the incidence of industrial anthrax in Massachusetts it is shown that:

1. Anthrax-infected hides, hair and wool are being imported from foreign countries.

2. Anthrax-infected hides are being shipped chiefly from Buenos Aires, Argentine; Hankow, China; and Calcutta, India.

3. Federal regulations do not prevent the importation of infected material.

4. Hides bearing the consular certificate have apparently caused anthrax cases.

5. Hides, hair, and wool can in most cases be successfully disinfected for anthrax spores.

6. Anthrax cases operated on have a fatality rate double that of the non-operative cases.

The following recommendations for the prevention of anthrax are made:

1. Quarantine of all hides, wool, and hair from anthrax-infected and suspected areas or areas about which information is lacking.

2. Disinfection of all hides, wool, and hair from anthrax-infected and suspected areas or areas about which information is lacking. This disinfection should be done in the country where the hides, wool, and hair are collected, preferably at the market center, where, by mass disinfecting, a trained corps of workers could disinfect successfully, efficiently, and at the lowest cost.

3. An anthrax survey should be made by a corps of trained men, acquainted with anthrax and the hide and leather industry. This survey should consist of field investigations, to ascertain the prevalence of anthrax in regions where hides, wool, and hair are collected for export, and the manner of collecting and preparing the different products for shipping. The collecting of definite data by permanent investigators would enable a consul to have a far better knowledge of the hides, particularly of those on which he is requested to issue the consular certificate.

4. The disposal of sludge from hide vats should be cared for in such a way that no material can overflow the land and thus "seed" it with anthrax spores.

For the disinfection of hair, live steam for fifteen minutes on opened and loosened bundles is recommended; for wool the method used in England and described in the report of the Departmental Committee Vol. II, cd. 9171, is the method of choice; and for hides the only satisfactory method so far devised is that of Schattenfroh, or a modification of the same, consisting in a soak for forty hours at a temperature

between 60 and 70° F. in a solution of 2 per cent. absolute hydrochloric acid and 10 per cent. sodium chloride. — H. F. Smyth.

THE DIAGNOSIS OF ANTHRAX FROM PUTREFYING ANIMAL TISSUES. *W. A. Hagan.* Jour. Bacteriol., July, 1920, 5, No. 4, 343–351. — A rapid diagnosis is often necessary, hence inoculation tests are at a disadvantage. The author describes a procedure whereby a diagnosis may be made in eighteen or twenty-four hours. The suspected material is cultured on agar plates and the typical anthrax colony recognized by means of the microscope. — Barnett Cohen.

RECOVERY OF STREPTOCOCCUS HEMOLYTICUS FROM RESTAURANT TABLEWARE. *C. C. Saelhof* and *W. J. R. Heinekamp.* Am. Jour. Pub. Health, Sept., 1920, 10, No. 9, 704–707. — The authors give the following summary of a series of sixty-three examinations of tableware in nine restaurants in Chicago:

1. Hemolytic streptococci were isolated from the washed dishes and tableware in small restaurants and cafes.

2. Six and thirty-five hundredths per cent. of the articles examined yielded this organism.

3. The strains of streptococcus hemolyticus were virulent for rabbits. They correspond to the human type.

4. For the protection of the public a better system of washing dishes is needed in the small eating places.

Besides the streptococci the following pathogenic organisms were recovered from eating utensils supposedly clean: pneumococci and B. coli once each, staphylococcus aureus thirty-one times, and staphylococcus albus twenty-three times. — H. F. Smyth.

SOAPS IN RELATION TO THEIR USE FOR HAND WASHING. *John F. Norton.* Jour. Am. Med. Assn., July 31, 1920, 75, No. 5, 302–305. — "Sterile hands are not obtained in the ordinary process of hand washing. More bacteria were found to be removed by the ordinary toilet soaps than by the special soaps. In other words, the cleansing properties of a soap are more important than its 'germicidal' or 'antiseptic' constituents.

"The soap solutions obtained in hand washing are of no practical germicidal or antiseptic value.

BACTERIAL CONTENT WITH RINSE WATER AFTER DRYING *

	Without Drying	After Drying
	580,000	17,500
	675,000	64,000
	1,760,000	238,000
	12,000	87,500
	17,000	52,500
	1,110,000	260,000
	144,000	30,000
	12,500	47,500
	72,500	23,800
	220,000	450,000
	46,000	2,630,000
		25,000
		3,000,000
Average	421,000	496,000

* The figures standing opposite in the columns have no significance.

"The soap left on the hands after washing has no germicidal action.

"In the whole process of hand washing done in the usual manner, the special so-called 'germicidal' or 'antiseptic' soaps exhibit none of these properties. Therefore, these terms are not proper to use in connection with soaps.

"Finally, since the hands may serve as a medium for the conveyance of bacteria in infectious diseases, it is important to remove these bacteria; and this may be done by the ordinary toilet soaps as effectively, if not more so, as by the special brands of so-called 'antiseptic' or 'germicidal' soaps." — C. K. Drinker.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

INDUSTRIAL DERMATITIS. *T. M. Legge.* Great Britain, Ann. Rep. Chief Inspect. Factories and Workshops for 1918, pp. 82–83. — "Dr. Bridge investigated the condition known as oil dermatitis which proved very troublesome in a large number of engineering works during the war, arising from the cutting oils, cutting compounds, and soluble oils used on automatic lathes and similar machines, and composed chiefly of mineral oil derived from the residue of petroleum left after distilling other oils which boil below 300° C. The malady has been known for a long time, having been described, with typical illustrations, in a paper by Dr. H. S. Purdon, in 1902, on *Acneiform Eruptions in Flax Doffers in Belfast.* The condition, Dr. Bridge says, closely resembles that seen in the green or paraffin sheds of the shale oil refineries,

but is milder in form. He describes the affections of the skin due to oil in engineering shops as, first, inflammation of the hair follicles (folliculitis or peri-folliculitis), secondly, septic infection, and thirdly, eczema. The hair follicles present the appearance of dusky red somewhat shaded papules, on the surface of the forearms and hands, and occasionally of the thighs. About the centre of each papule is a dark and somewhat depressed black spot. These inflamed follicles, produced by the blocking of the hair follicles and ducts of the sebaceous glands by a paste of oil and dirt, persist for a considerable time.

"Injury to the skin is the primary factor in the production of septic infection and as lubricating fluids contain fine sharp particles in suspension, mere movement of the fingers or leaning the arms on the work may produce sufficient injury to the skin as to cause the primary lesion, through which the germ enters. For prevention, cleanliness of the workers' hands and arms, and the removal of the oil and dirt, unavoidably present, is essential. Dr. Bridge describes as having proved satisfactory, not only in prevention, but also in curing the condition, washing with ether soap and powdering the arms before and after work with equal parts of zinc oxide and starch.

"Numerous inquiries into outbreaks of eczema arising out of conditions due to the war were made. It is remarkable how many of them were due to derivatives of coal tar, petroleum and shale oil, used as explosives or dyes (tetryl, picric acid, T.N.T., nitroso-phenol), and, therefore, probably due to the same essential cause as pitch and petroleum acne. Generally the substances setting up industrial eczema are, first, chemical irritants and caustic agents like bichromate of potash and arsenious acid and certain finished dyes; secondly, those which dissolve and remove the natural grease from the skin, such as turpentine, petroleum benzine, benzene, and its homologues, and the intermediate bodies, their nitro- and amido-derivatives; thirdly, processes which soften and macerate the skin such as alkalies; and fourthly, processes which mechanically injure the continuity of the skin, such as brushing, scratching and rubbing. With the oily and greasy material removed, the dry skin cracks, and the most important thing in prevention is to try and restore, as far as possible, the natural lubricant to the skin.

"If irritating powders are handled — and this has been especially brought out in connection with the use of tetryl (Prevention, symptoms and treatment of tetryl dermatitis by Enid Smith, British Medical Journal, 24.9.16; An investigation into the cause and prevention of industrial diseases due to tetryl, W. L. Ruxton, British Journal of Dermatology, Jan.–March, 1917; The properties of tetryl, Lucy Cripps, M.B., British Journal of Dermatology, Jan.–March, 1917) in the handling of which hardly any workers escaped an initial incapacitating attack of dermatitis — much the best preventive during work was found to be dusting the skin with a dry powder, such as talc and starch, rather than the use of an ointment, which tended to collect and retain the noxious powder. The spread of eczema from the hands to other parts of the body indicates that the pathogenic germs on the skin have set up a septic infection.

"Dr. Bridge and Mr. Verney investigated an outbreak of eczema in which 40 to 50 cases had occurred within 15 months of the starting of the manufacture of phenacetin in what Mr. Verney described as 'an old and unsuitable building, too small for the plant, and ventilated only through the door and by openings in the roof and near the eaves.' Seeing the conditions of manufacture, Dr. Bridge found it difficult to arrive at the exact cause, but believed that the intermediate products and acids used led to a drying of the hands with subsequent cracking and the formation of vesicles; while the phenol vapour accounted for an acute erythema and swelling of the face occurring so rapidly, as within an hour completely to occlude sight.

"Not a few outbreaks arose from the use of a strong alkaline solution known as 'lyco' used in cleaning old fuse caps. In one case the firm had been ignorant of the strength in which to use the solution and made it much too strong. The fuse caps, after inadequate washing, were scratch-brushed, with damage to the fingers. The burns disappeared on using the solution in proper strength, but the use of the scratch-brush was still a source of trouble. The recommendations made were (1) daily inspection of fingers; (2) application after washing in running water of impermeable waterproof plaster. At another factory where there was no scratch-brushing, the effect of the solution was most noticeable where the skin was kept moist, as under a ring.

"An outbreak involving over 30 persons occurred at a dye works in a weaving shed from

cops dyed a sky blue tint. Dr. Prosser White . . . attributed the cause of this outbreak to the powerful alkaline and caustic processes through which the thread would first pass, subsequently cleared by passage through a weak acid bath. The latter process had not been properly carried out, so that zinc and quick lime were concentrated on the thread."

Dermatosis Accompanied by Febrile Symptoms Caused by Direct or Indirect Contact with Spoiled Corn. *G. Romiti.* Reviewed from Gazzetta degli Ospedalia e delle Cliniche, 1919, in Il Lavoro, May 31, 1920, 12, No. 1, 22–23. — An epidemic of dermatitis accompanied by febrile symptoms was observed by the author in the fall of 1916 in the commune of Ponte Buggianesi, and during the same season of the three following years a smaller number of cases of the same affection was seen. The cause seemed to be contact with spoiled corn or even with the clothing of one who had handled such corn. A few minutes after such contact an intense itching would be felt, making the victim wash himself to get rid of the irritant. Even prompt bathing, however, would not prevent the further development of the attack. In a few hours an erythema appeared over the inner surface of the arms, the bend of the elbow, the inner surface of the thighs, and the neck, and quickly passed into a pemphigoid eruption, with itching. After six hours blisters would form and as they increased in size the erythema disappeared. Together with the skin symptoms, there was much restlessness, a severe headache, nausea, vomiting, and fever preceded by chilliness. The fever lasted from six to twelve hours and on the following day the systemic and local symptoms gradually improved. — A. Hamilton.

Clinical and Experimental Observations on the Effect of Carbide on the Human and Animal Skin. *Otto Sachs.* Wien. klin. Wchnschr., 1920, 33, 333. — Carbide used for making acetylene produces a dermatitis and later numerous punched-out sores similar to and of the same origin as those produced by lime. Finely pulverized carbide was rubbed into the skin of a rabbit's ear and a dermatitis resulted which was followed by necrosis. The same picture was obtained when water was added to carbide which was merely laid upon the skin. As a prophylactic measure, it is suggested that the hands of workers be rubbed with vaseline to keep away moisture. — Barnett Cohen.

Epitheliomatosis Ulceration among Tar Workers. *W. J. O'Donovan.* Brit. Jour. Dermat. and Syph., July, 1920, p. 215; Aug.–Sept., 1920, p. 245. — This is a well-balanced study of an interesting subject. The paper contains the clinical and pathological records of twelve in-patients and six out-patients treated at the London Hospital. The youngest sufferer from tar cancer was 33 years of age, and the shortest duration of employment before any lesion showed evidence of malignancy was ten years. The effects of pitch dust upon the eyes in cold weather are lacrimation, severe smarting, all forms of conjunctivitis and even ulceration. The skin smarts and is painful in pitch workers if exposed to the air, immediately after washing, especially in the summer months. Pitch warts are usually regarded by the employees as of little moment, but O'Donovan says "that any papilloma of 1 cm. in diameter which does not show signs of necrosis in three months, or loses its cap and becomes an ulcer with rolled edges is to be diagnosed as a tar carcinoma." He tells us that in one works employing only 350 men, the first quarter of 1920 furnished three cases of epithelioma.

From a tabular review of sixteen cases, he draws the following conclusions:

1. Ages vary of those affected with carcinomatous lesions.
2. Long duration of employment is common before any lesion becomes serious.
3. Operative treatment is needed for many growths which give only a short history.
4. In a few cases single lesions of long duration have required in the end to be removed.
5. Some tar warts may exist twenty-five years without showing any signs of malignancy, whilst a new lesion by its change of type and rapid growth will cause the worker to seek early surgical advice. The writer's experience is that malignant growths affect the face, scrotum and forearm in diminishing frequency. No scrotal cases were the result of pitch dust. In two instances the glands were enlarged and in one of these they showed malignancy. One carcinoma of eighteen months' duration proved to be inoperable.

Discussing the pathology of this disease, its recent study by Schamberg is reviewed and some parts of it quoted. The writer then proceeds to describe his own investigations. They

consist of the detailed examination of eight lesions removed from a case under his own care and the histology of five others preserved in the Institute attached to the London Hospital.

He points out that his findings are always constant. The keratoses are formed by great hypertrophy of the epidermis of one or more follicles. Dense masses of squamous and polygonal cells make up the cancerous growths and a wide, or narrow hypertrophied margin surrounds the "cell nests." Though the cell invasion produces excessive tissue reaction, he does not consider it becomes sufficiently dense to strangulate and thus cause necrosis. When this does happen, he is of opinion it is due to interstitial hemorrhage.

A review of the etiology and the work of investigators in this field of research concludes a valuable paper. The reader will probably rightly infer that the exact factor (or factors) common to a group of, or to individual coal tar products, which occasion these cancers, awaits further search. — R. Prosser White.

Pitch Ulceration. *T. M. Legge.* Great Britain, Ann. Rep. Chief Inspect. Factories and Workshops for 1918, pp. 81–82. — "By an arrangement with the occupiers of the principal factories in South Wales for the manufacture of briquettes, reports have been obtained of cases of pitch ulceration, in several epitheliomatous in nature, which came to their knowledge. These cases were usefully followed up by inquiry by the certifying surgeon so that, for the years 1914–1918, particulars have been received of 64 men who have been affected, some of them more than once in the time stated. This is a very disappointing result, following on the inquiry which was made by Mr. A. H. Lush, in 1911, and again in 1913, into the need for regulations requiring washing and bath accommodation, overall suits, prevention of dust, and protection against injury to the eyes.

"The two factories, in which by far the most satisfactory arrangements for washing accommodation and supervision of the workers have been made, account for 44 of the 64 cases reported. These works employ the largest number of workers, and the high proportion in them is due to the closer supervision exercised by the management, resulting in the reference for treatment of all cases of warts found. For this reason also the cases reported from them are of slighter severity than from the others.

"The nature of the work is to grind material first to powder before compressing the pitch and fine coal dust into blocks. Improvements made to reduce the excessive dust have not been very successful. Great difficulty is experienced in maintaining the conveyor casings dust proof, and in addition it has to be borne in mind that the mixture of pitch and coal is of an explosive nature. The percentage of men using the baths is very small and is mostly confined to the younger men, who are not necessarily those most exposed to the dust. The percentage of men who change their clothing before going home is also very small. No really satisfactory preparation has yet been found for allaying the irritation of the dust on the skin. Dusting with starch powder or fuller's earth is used by some to relieve the burning and irritation on exposure to wind and sun, which is noticeable particularly after washing. In addition to the pitch warts, particulars were received of four cases of ulceration of the cornea due to pitch dust, involving in one case complete loss of sight. Crêpe or goggles are worn by some men but not universally.

"Incidence of the occupation of the men attacked was as follows: — Overmen 5, pitch discharging 8, pitch digging 1, wheeling 4, grinding 7, enginemen and firemen 5, pressmen 5, labourers 7, crane drivers 2, shippers 16, carpenters 3, and pitch winch boy 1. Of these, 15 were reported twice. Of the 64 cases, 17 were reported as severe, 19 as moderate, and 28 as slight. Severity depends on age and duration of employment. Thus, of the 64 men, 14 per cent. only were under 40, as compared with 80 per cent. of 40 years and over, but of the 36 cases which were marked as moderate or severe, only 8 per cent. were under 50. Of the 64 men, 12.5 per cent. only had worked under 10 years, and 87.5 per cent. for more than 10 years; indeed, 62.5 per cent. had worked for 20 years or more. Of those marked moderate or severe 7.5 per cent. only had worked under 10 years.

"The part of the body affected was the lip in 7 cases, the eyelid in 8, other parts of the face, head or neck in 22, scrotum in 18, hand and arm in 12, and other parts of the body in 1.

"The question of dilution in patent fuel works arose during the war, and although it was considered extremely unsuitable work for women, it had to be allowed to some extent. The three effects of pitch which had to be considered in this connection were (1) the stinging of the skin from exposure to wind and sun, (2) the formation of pimples and warts, and (3) the

occasional development of cancer. Seeing the long duration of employment before the epitheliomatous condition supervenes, there was no fear of the women contracting this. As regards the other two effects, the women, because of their more delicate skin, would probably suffer more than the men. The work they were limited to was trolleying, stacking, and light work, such as sweeping up.

"In addition to the epitheliomatous condition in pitch works, information was received of eight cases contracted either in tar works or by workers coming in contact with tar between 1914 and 1918. Four were reported as severe, suffering from epithelioma of the scrotum, two of which proved fatal, and one from epithelioma of the forearm, requiring amputation, in a man aged 60 engaged in net making and so handling tar.

"An exactly analogous malady arises in the refining of paraffin as carried on in the five shale oil works in Scotland. As a result of a conference held in 1918 with representatives of employers and workers, an agreement was arrived at, which Mr. H. J. Wilson (Northern Division), who acted as chairman, summarises as follows: —

"Workers in paraffin sheds to be provided with the protective clothing to wear above ordinary clothes.

"Spray baths to be provided for use of workers in paraffin sheds with hot and cold water laid on, soap and towels, locker for clothing and means of drying and washing working clothing. The bathrooms to be kept warm and clean and placed under charge of some responsible person.

"Workers in paraffin sheds to be medically examined quarterly by the certifying surgeon who will have power of suspension and control of first aid arrangements.

"An ambulance room with usual first aid appliances and, in addition, ointment for treating skin affections, and appliances for enabling persons to breathe outside air when in a poisonous atmosphere."

MINERS' NYSTAGMUS. Lancet, June 5, 1920, 198, No. 5049, 1224, 1230. — A writer in this number of the *Lancet*, referring to Dr. Stassen's book on "The Fatigue of the Visual Apparatus of Mine Workers" (La Fatigue de l'Appareil Visuel chez les Ouvriers Mineurs), says that it will rank with that of Dr. Lister Llewellyn among the chief authorities on miners' nystagmus. "As to the main cause of the disease," the writer continues, "the two are in entire agreement, and, indeed, the evidence is overwhelming that defective lighting of coal-mines is, in the main, responsible." Dr. Stassen says that the visual apparatus of the miner is overworked, owing to the length of time passed in partial darkness, and this overwork produces a nervous syndrome characterised by inco-ordination and exaggeration of the visual reflexes. Although the symptoms which precede or accompany nystagmus vary, they are all alike due to visual fatigue from work in defective light. The statistics and clinical observations which Dr. Stassen gives all tend to the same conclusion as to the causation of the disease.

The American Bureau of Mines has carried out some investigations on the same subject, and has published the results in the pamphlet by Frederick L. Hoffman on "Miners' Nystagmus" (Government Printing Office, 1916). These results are based almost entirely on information derived from European sources, from which is deduced the conclusion that a constrained position of the body, with the eyes directed upwards, is the chief source. This view is, of course, no longer held by English authorities who have investigated the matter of late years.

The British Journal of Ophthalmology (April, 1920) reports in full the recent discussion by the Illuminating Engineering Society (Eng.) upon the illumination of mines. Dr. Lister Llewellyn opened the discussion and devoted his attention chiefly to certain practical recommendations for the improvement of lighting in mines, with special reference to the causation of nystagmus by defective illumination. "A notable feature of the discussion," says the *Lancet*, "was that no one was found to defend the view that the cramped position of the miner at his work is mainly responsible for nystagmus; this is in contradiction to the teaching of Mr. F. L. Hoffman's pamphlet, issued by the American Bureau of Mines, but the American report has no basis of personal experience. Whatever factors other than deficiency of illumination may enter into the causation of nystagmus, it is amply proved that the most important is the amount of light reflected from the surface of the coal at which the miner is working." A British government inquiry is now being conducted into the question, and a joint inquiry by ophthalmic surgeons and engineers is also being organised. — W. E. Cossons.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

ACCIDENT PREVENTION IN RUBBER INDUSTRY. *H. S. Poole.* Safety Engin., June, 1920, 39, No. 6, 305–308. — The main causes of accidents in a rubber mill may be broadly classified into four groups: fire, careless use of small tools, hazardous machinery, and vapor poisoning. Approximately 75 per cent. of the fires occur during the dry cold weather of January and February. This is mainly due to three causes: (1) Many of the processes require the use of naphtha and other inflammable solvents, which in a heated dry atmosphere evaporate more quickly than in a humid one; (2) fabrics and other combustible material are drier and more liable to ignite; (3) static electricity accumulates and builds up a considerable charge and potential in a heated dry atmosphere. Minor accidents due to use of small tools result mainly from careless handling, slipping, and carrying of sharp knives used in many operations. The rubber mills, calenders, tubing machines, punch presses, and pressure vulcanizers are the most hazardous machinery in a modern rubber plant.

In the compounding of certain rubber stocks, use is made of anilin oil, and the safe handling of this oil calls for extreme care on the part of the operator. This gas is poisonous in very small quantities when inhaled, and as it has a very pleasant odor and is not irritating, it does not give warning of its dangerous nature. The spilling of anilin oil on the hands, feet, and clothing may result in severe poisoning by absorption through the skin. It is also virulently poisonous when taken into the system through the stomach. Mills on which this oil is used should be provided with hoods connected with exhaust fans to carry off the gases. — R. M. Thomson.

INFLUENCE OF THE WAR ON ACCIDENT RATES IN THE IRON AND STEEL INDUSTRY, 1914–1919. *Lucian W. Chaney.* U. S. Bur. Labor Statis., Month. Labor Rev., June, 1920, 10, No. 6, 151–163. — The author summarizes his article as follows:

"1. Whatever form of classification is used (the fundamental departments, production groups, or cause groups) the same trend is shown.

"2. The period just prior to the war was a period of industrial decline. Employment went down, 'labor mobility' almost ceased. Accident rates dropped more rapidly than employment.

"3. As soon as the effect of European war orders began to be felt in this country employment began to increase. The accession of inexperienced men increased even more rapidly. Accident rates went up.

"4. The iron and steel industry was alarmed by the increasing accident occurrence and undertook a strenuous counter-campaign.

"5. This was very successful in controlling and finally causing a decline in minor injury.

"6. Major injury was not controlled so perfectly but was prevented from rising above the level of 1913 and was finally considerably reduced.

"This review of the war period strongly supports the contention that even in the most strenuous times it is possible to hold in check the tendency to rising accident rates by the application of the three cardinal methods of the safety movement: (1) adequate instruction of the men in skillful methods of work; (2) careful supervision of the well-instructed men; (3) 'engineering revision,' by which the safety of work places is increased." — R. B. Crain.

INDUSTRIAL SURGERY

STANDARDIZED SURGICAL METHODS IN INDUSTRY. *C. D. Selby.* Mod. Med., May, 1920, 2, No. 5, 360–362. — This article, read during the annual meeting of the American Association of Industrial Physicians and Surgeons at New Orleans, April 26 and 27, 1920, was prepared for the purpose of suggesting lines of thought and for arousing discussion in a round table conference to determine whether standardized surgical methods in industry are desirable, if so, of what they shall consist, and what is the best means for securing their general adoption. Standards are presented for the treatment of fresh wounds, infected wounds, clean wounds, indolent wounds, and burns. A list of equipment and materials for minor wound treatment is offered for discussion, together with proposed means for securing adoption of standards. — M. C. Shorley.

Wound Infection in Industry. *Drury Hinton.* Mod. Med., June, 1920, 2, No. 6, 431. — The suggestions made in this paper are based upon the experience of Dr. George W. Crile. All wounds are potentially infected but heal promptly if made and kept surgically clean. With the efficient surgeon who is prepared for immediate action there is not the least excuse for infection. The results of the treatment as outlined in this article have been followed out in some 2400 cases at the Lakeside Hospital, Cleveland, Ohio, and there have been only three infections in the past year. All three were because the men failed promptly to report to the dispensary for treatment. Throughout the article special emphasis is laid upon the importance of prompt and immediate action. — L. A. Shaw.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

Types of Fatigue. *Percy G. Stiles.* Am. Jour. Pub. Health, Aug., 1920, 10, No. 8, 653. — The author defines fatigue in general as depression of working capacity, owing to a katabolism running above the average for the tissue. Muscular fatigue, because of the large masses of active protoplasm involved, can extend its influence to other systems. In narrowly localized brain activity the metabolic process cannot be large and true cerebral fatigue is probably far less common than is supposed. The use of different cell-groups in rotation may minimize the demand upon each member. The ordinary cause of diminishing mental efficiency is the desire for a change. In a reasonably trained system this is a wholesome impulse. What we call nervous fatigue, referring to a condition which is pathological and often of long duration, is due primarily to lessened inhibition. Many of its features are symptomatic of bad habits established in the ill-controlled system. Unusual outflowing currents may pervert the action of the endocrine organs. Recovery from nervous fatigue is less a matter of correcting the metabolism than of desirable habit formation. — H. F. Smyth.

Monotony and Fatigue in Shop and Office. Mod. Med., June, 1920, 2, No. 6, 425–426. — The importance of psychological and physiological research in relation to industrial welfare is now recognized by the medical profession. The monotony of certain trades and industries is largely responsible for the ill health and discontent that prevail among the workers in these trades and industries. The human machine requires something more than good hygiene. The worker must perform his daily task in comfort and under circumstances in which sufficient variety exists to dispel or palliate the gloom of monotonous toil. It is with the object of studying these conditions that it has been proposed to found a British National Institute of Psychology and Physiology. The study will be made chiefly through the agency of well-equipped laboratories. Tests will be made in the laboratory for the purpose of establishing standards by which workers can be selected for work for which they are best fitted mentally and physically. Another function of the institute will be to provide training courses and lectures for investigators, managers, foremen, and welfare workers in the practical applications of psychology and physiology and to undertake investigations at factories and offices in relation to any special problems. Through the agency of such an institute, waste of time and the unnecessary fatigue which may be due to ignorance will become inexcusable. — L. A. Shaw.

The Speed of Adaptation of Output to Altered Hours of Work. *H. M. Vernon.* Industrial Fatigue Research Board, Report No. 6. His Majesty's Stationery Office, London, 1920, pp. 33. — The author summarizes this pamphlet as follows:

"When the hours of work are reduced, there is often no change in the hourly output for several weeks. Then it begins to mount slowly, but it takes a long time before it attains a steady value in equilibrium with the altered hours. The adaptation period was found to be about two months when the hours of tinplate millmen were reduced from 8 to 6 per shift, but thirteen months when those of open hearth steel melters were reduced from 12 to 8 per shift. In fuse operations it varied from two to four months, and in big shell operations from two months to six months or more. The time required cannot be predicted, but it is usually shorter in the simpler operations than in the more complex ones.

"When tinplate millmen were changed back

from 6-hour shifts to 8-hour shifts, their output fell without delay to approximately its equilibrium level; *i. e.*, there was little or none of the gradual adaptation observed in the reverse change of shifts. This evidence demonstrates the evil effect which intermittent periods of overtime must have on output.

"Fatigue in tool setters and laborers, or its removal, may have an outstanding effect on the output of the women under their charge; for when, at a 9.2 inch shell factory, the men's hours of work were reduced from $63\frac{1}{4}$ per week to 54 per week, whilst those of the women were increased from $44\frac{1}{4}$ to 54 per week, the women's hourly output at once began to increase rapidly, and in various operations it improved 10 to 42 per cent. on its previous value. The fatigue of the men was suggested by the fact that when they were working the long hours they lost 11.8 per cent. of their time, but during the shorter hours they lost only 6 per cent. of it.

"In the four shell operations investigated, the hourly output of the women, when on a $44\frac{1}{4}$-hour week, was 5 to 21 per cent. below that of the men when working under equal conditions, but on a $63\frac{1}{4}$-hour week.

"The amount of work (active and passive) done by women engaged on three shell operations was ascertained by careful inspection, and it was found that the women engaged on the heaviest operation lost 60 per cent. more time than those engaged on the lightest operation." — C. K. Drinker.

STRENGTH TESTS IN INDUSTRY. *E. G. Martin.* U. S. Pub. Health Ser., Pub. Health Rep., Aug. 13, 1920, 35, No. 33, 1895–1926. — The author concludes with the following summary:

"1. Fields of usefulness for strength tests are seen in (*a*) physical classifications, to aid in selecting operatives for particular jobs; (*b*) as criteria of physical condition in connection with the relationship of physical condition to industrial efficiency; (*c*) as criteria of fatigue.

"2. The method of testing the strength of industrial workers is described in detail.

"3. Evidence is presented showing that with males laborious operations tend to develop approximately equal strength among the workers therein; in other words, there is a 'standard' strength for each job. A table of the strengths associated with the various operations studied is given.

"4. Male workers at very light operations are shown to have, in general, the average strength for adult males. A single group, made up of men with various disabilities and engaged in a very light sitting operation, had an average strength markedly less than the mean for healthy adult males.

"5. Evidence is offered that within individual groups of males the stronger workers are likely to be more efficient industrially than the weaker.

"6. The occurrence among male workers at laborious operations of individuals whose strength is much less than the standard for the job, and somewhat below the usual figure for healthy adult males, is assumed to be indicative of 'staleness' due to persistent over-exertion. Workers giving signs of 'staleness' show greater variations in the distribution of strength among the muscles in successive tests than do normally strong operatives.

"7. The question of the genuineness of poor strength showings is discussed and evidence given that it is more difficult to make deliberately an inferior test than to put forth full strength, and also that the variations in successive tests would necessarily be wider if the tests were fraudulent than are seen in the poor series here under examination.

"8. That physical condition, as indicated by the strength showing, tends to bear a definite relationship to the industrial efficiency as expressed in output is shown by comparisons of day-to-day records of various male workers.

"9. Observations are given showing that there is a definite tendency for the strength of all the male workers in a single environment to fluctuate similarly from day to day. The conclusion is drawn that external factors are operative in determining strength, and that these act on all the workers alike. Among these the temperature at which the work is carried on suggests itself as important. There is evidence that persistent exposure to temperatures above 30° C. (86° F.) is unfavorable to strength. Relative humidities between 70 and 80 per cent. appear to favor high strength showing. Other climatic influences have not been demonstrated to be operative. There is some suggestion that psychic influences, such as the arrival of pay day, may be operative. Since strength correlates with productiveness, the analysis of these external factors promises to be significant.

"10. In general, strong male workers show less fatigue than do weaker workers. This holds for workers regardless of the nature of their work and for the strong and weak groups within particular operations.

"11. Evidence is given indicating that the impairment of physique due to exhaustion may be so severe as to require considerable time of rest for recovery to normal strength.

"12. There is evidence that the effects of fatigue are persistent, in that they tend to appear on the day following a day of fatigue. Severe fatigue is more likely to show this persistent effect than is mild fatigue.

"13. Days of poor physical condition are more likely to be followed by days of fatigue than are days of good condition, or days on which no demonstrable fatigue appears.

"14. There is no evidence that the strain of night work in an eight-hour shift, changing every two weeks, impairs physique. A permanent night shift, working twelve hours nightly five nights in the week, averaged 15 per cent. lower in strength than the day shift doing precisely similar work; but the evidence is insufficient to decide whether or not this poorer showing was actually due to the night work.

"15. Women operatives show a gradation of strength corresponding with the laboriousness of their work; the actual strength showing is, however, regularly less than would be anticipated in manual workers.

"16. Women employed at tasks requiring mental alertness or close concentration make better strength showings than those engaged in routine manual toil, even though the latter be relatively heavy. A corresponding relationship is not apparent among male workers.

"17. There is evidence that among women, as among men, external factors influence the strength showing. The workers in a similar environment tend, as a group, to vary in the same direction from day to day.

"18. Among women, as among men, demonstrable fatigue is more manifest in weaker workers than in stronger. The most pronounced indications of fatigue are presented in an operation requiring close concentration and carried on in a disagreeable environment."—M. C. Shorley.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

Safety and Medical Methods in Connection with Compressed Air Work. *Edward Levy.* Safety Engin., June, 1920, 39, No. 6, 293–298. — Certain changes in the laws relating to compressed air workers have been formulated at the suggestion of the New York State Department of Labor by representatives of compressed air workers, contractors, insurance companies, Industrial Commission, and the Public Service Commission. A short explanation is made of the physiological action that takes place in the human body when men work in compressed air, such as the nitrogen that is taken up in solution, partial pressure of carbon dioxide and the danger from carbon monoxide.

The new law requires that any contractor carrying on work in which men are permitted to work in compressed air shall employ a physician who shall have had experience in that particular line of work. Any person not having previously worked in compressed air shall not be permitted to work in a pressure exceeding 17 pounds without first having been tested by the physician in the medical lock, nor shall any such person be permitted to work under any pressure for longer periods than one-half a day period until he shall have been re-examined by the physician and found to be physically fit for such work. It is also a duty of the physician to keep complete records of the examinations made by him on a uniform blank and to note all answers to certain questions. The installation of a medical lock is not considered necessary until the pressure reaches 17 pounds or over.

The three important factors in the causation of compressed air illness are the height of the pressure in which men work, the length of time spent in air pressure, and the time and method of decompression. There seems to be no danger up to 22 pounds, and no serious cases have developed up to 29 pounds, but at this point, namely 29 pounds, the height of pressure is a factor, and becomes more important as the pressure is raised if the hours of labor are not properly adjusted. Suggestions as to the division of hours and the changes of shifts so as to make possible a full twenty-four hour schedule are included. The law strictly prohibits men from working more than two shifts in twenty-four hours. The method of decompression outlined is absolutely safe if adhered to.

One of the greatest safety factors is to have the men stay on the job for at least one hour after locking out. Sixty-four per cent. of all cases of illness, and the severe cases, as a rule develop within one hour after decompression, when most of the men are some distance away. — R. M. Thomson.

DEATH CAUSED BY LESS THAN 110 VOLTAGE. *E. J. Riederer.* Safety Engin., July, 1920, 40, No. 1, 24. — This is a report of an accident which occurred in one of the Atlas Powder Company's works to an employee by an electric current (alternating) of less than 110 volts. The victim was disconnecting an electric fan that was connected to the line by an extension cord. The cotton gloves which he wore were soaking wet. When he took hold of the electric cord so as to unscrew the connection of the fan, he received an electric current which prevented him from doing his work, and also from letting go of the electric wires. He told another employee, who happened by, to shut off the current. While the latter was in the act of doing this, the left hand of the victim was brought to his chest directly under his heart, and the right side of his body was forced against some wet timber. When the current was shut off the man fell over, dead. All efforts to resuscitate the victim were of no avail.

"It is of vital importance to impress on all employees that any electric current may be dangerous, depending on circumstances or conditions, and that extreme care should always be used in handling electric equipment, no matter how high or low the voltage may be. It also brings out the importance of very careful inspection at frequent intervals of extension cords; also that they should be used only when absolutely necessary — and then only if they are in perfect order." — R. M. Thomson.

REINFORCED CONCRETE FROM THE ELECTRO-HYGIENIC STANDPOINT. *Stephan Jellinek.* Wien. klin. Wchnschr., 1920, 33, 364–366. — Reinforced concrete offers a certain hazard in power plants and elsewhere if it has a low dielectric capacity. A short circuit may be established through the body of some worker touching a source of current. Frequent tests of the conductivity should be made to detect such a state in the material. — Barnett Cohen.

WOMEN AND CHILDREN IN INDUSTRY

THE PERFORMANCE OF THE MATERNAL FUNCTION BY WOMEN ENGAGED IN HOME INDUSTRIES. *Carmagnano.* Reviewed from La Pediatria, No. 5, 1920, in Il Lavoro, May 31, 1920, 12, No. 1, 23–26. — Carmagnano discusses the performance of the maternal function by women engaged in home industries, their fecundity, how their children are fed, and what the physical condition of their children is. He draws his conclusions from a study of the histories in the records of the Pediatric Clinic of Turin of 331 women who were employed in home work, such as weaving, tailoring, various kinds of seamstress work, etc. In general, their hours were long, often extending far into the night, the pay was small, the housing insanitary, the food insufficient. For purposes of comparison the author then took the histories of 2800 housewives who visited the clinic, women of the working class but engaged only in their own housework, and of 117 peasant women. The differences between these three classes show strikingly the evils of tenement house industries.

	Women in Home Industries	Housewives	Peasant Women
Per cent. of abortions and stillborn	15.2	11.9	6.6
Grade of fecundity ...	2.7	3.4	4.0
Proportion of abortions to pregnancies	1 in 6.5	1 in 8.4	1 in 15.1
Mortality rate of children born alive.....	21.2	20.4	15.1
Per cent. of children suckled by mother..	63.0	74.2	89.7

Since the housing conditions of the three groups were similar, the author concludes that the difference between the home workers and the other two groups lies in the exhausting work of the mother, preventing her from giving proper care to her babies and even from suckling them herself. — A. Hamilton.

A SOCIOLOGICAL AND BIOLOGICAL STUDY OF THE EFFECTS OF STUDENT LIFE UPON THE HEALTH OF WOMEN. *M. Hirsch.* Archiv für Frauenkunde und Eugenetik, April, 1920, 6, Nos. 1 and 2, 1–43. — This is an interesting study of the effects of the student life upon the health of women. The whole result of the author's statistics and questionnaires is to show that the student life is not menacing to the health of women. The time of sexual maturing is the danger time, but the investigations fail to show any deleterious effects that are general and due to study itself. It is only excess and over-exertion that are harmful. A question-

naire sent to academic women brought data showing that with advancing studies in all the departments from which the facts were gathered harmful results are less frequently reported, and improvement in health and beneficial effects of the academic and professional life are more frequently mentioned. The author concludes that there is no occupation that brings so little danger to health as the academic life. Even with medical women, whose profession makes large demands upon energy, improved health with continued work is indicated, and the percentages for harmful effects are about the same for various periods of the academic and professional career. Investigations of the relations between academic life and motherhood show, in the opinion of the author, that the diminished productivity in the class investigated is due to causes that can be traced to psychic and physiological factors rather than to failure in the reproductive powers. — G. E. Partridge.

On the Sickness Rate of Women Industrial Workers during the War. *Ettore Tedeschi*. Il Lavoro, May 31, 1920, 12, No. 1, 2–6. — In the present transition period from war to peace it is very important to examine the results of war time experience and decide what sort of personnel is best adapted to efficient and productive labor. During the war many thousands of women entered industrial life — a necessity at that time when the country needed every available man in the prosecution of the war — but the question now arises, have women shown themselves fitted to such work, is factory labor good for them and for the family?

The observations on which this article is based were made in a machine shop in which the women were doing lathe work. They showed a surprisingly rapid loss of health and strength. Women who had entered the shop in blooming health were soon pale, complaining of fatigue, headache, loss of appetite and lessened capacity for work. The physician in charge came to the conclusion that if such symptoms were neglected there was grave risk of tuberculosis developing, indeed a latent tuberculosis was probably present, but that if the women were made to take a vacation and were well cared for this might be avoided. The effect of this new kind of work was especially noted among the women on the night shift, although the actual strain of labor was lighter there, since supervision is never so strict at night. Two or three nights seemed to cause as much fatigue as a couple of weeks of day work. Women have proved themselves far less well adapted to industrial work than men and if they are to be retained in Italian factories there must be more medical supervision, shorter hours and no night work.

A distressing feature of machine shop work for women during the war was the effect of sperm oil, used as lubricant, which caused not only a dermatitis which was very obstinate and hard to treat, but also nausea, with loss of appetite. Here also women suffered more than men. — A. Hamilton.

In Favor of the Exclusion of Women from the Printing Trades. *Luigi Devoto*. Il Lavoro, May 31, 1920, 12, No. 1, 11–17. — Since 1910 Devoto has been an energetic opponent of the employment of women in the typographical trades and has twice, in 1908 at Lucerne and in 1910 in Lugano, tried to convince the International Association for Labor Legislation to declare itself against it. Both Congresses postponed the decision and the question came up again at the meeting of 1912 in Zurich, where Devoto and Carozzi, the latter of whom had made an exhaustive study of the printing industry in Italy, defended their thesis that the employment of women in so dangerous a lead trade as printing was detrimental to the race. They wished to exclude women from type founding — in Europe a branch of printing — from type finishing and from hand composition, linotype work, and stereotyping. They base their argument on the prevalence of tuberculosis among compositors — 20 per cent. of those that have come to the Milan clinic are tuberculous — and on the well-known fact that tuberculosis and lead poisoning go hand in hand. Only 150 women compositors have come under Carozzi's observation, but he states that they show an unusually poor physical condition compared to their condition prior to taking up this work. The printing trades have in general doubled the tuberculosis rate of other dusty trades in which the workers are not exposed to lead, and this is due not only to the presence of lead dust but to the fact that the industry attracts especially those boys who are delicately made and not strong enough for heavy occupations. Therefore women, who are more sensitive to the effects of lead, of dusts and of work requiring unphysiological postures, will suffer more than men

from the evils of the printing trade. There is no urgent need for women to enter such occupations and Devoto hopes that, for the good of the woman herself, for her children, and for the race, her participation in this trade will be prohibited. — A. Hamilton.

Hours and Conditions of Work for Women in Industry in Virginia. U. S. Dept. Labor, Women's Bur., Bull. No. 10, March, 1920, pp. 32. — A request from the governor of Virginia sent to the secretary of the U. S. Department of Labor resulted in a survey by the Women's Bureau of the Department of Labor of hours and conditions of work for women in industry in Virginia. The facts obtained through the survey include such as pertain to working hours, working conditions, and the administration of labor laws. An interview of fifty-nine women representative of the industries examined is also of interest. Facts thus obtained are used as the basis of recommendations for standards of work to be established either through specific laws or through legislation empowering the State Bureau of Labor and Industrial Statistics to regulate conditions of employment. — L. A. Shaw.

Child Labor and Vocational Training. *G. Loriga.* Il Lavoro, June 30, 1920, 12, No. 2, 44–51. — Loriga criticizes the Italian law under which children are allowed to enter industry at 12 years of age, to work eleven hours out of the twenty-four (which with the required rest periods means that the child spends thirteen hours inside the workshop), and the removal of all hygienic control from the working boy when he has reached 15 years of age. Thus an excessive strain is often put upon the youthful organism just at the time when rapid growth and pubescence are making a heavy demand on his strength. Nor is the boy's work always made lighter than the adult's on account of his age; on the contrary, he is often required to keep pace with a man and even to do extra work under compulsion of his stronger fellow-workers. As reforms, Loriga urges the postponement of entry into industry till after the completion of puberty, which, coming between 16 and 18 years, may conveniently be placed at 17 years; shortening the day to six or seven hours with rest periods; and insistence on proper sanitation of all workshops. In addition, vocational guidance and education are essential for the youthful worker. Scientific organization of industry is impossible so long as child workers are regarded simply as a part of the mechanism of production. — A. Hamilton.

INDUSTRIAL PSYCHOLOGY AND INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS

Twenty-Eighth Annual Meeting of the American Psychological Association. Jour. Educational Psychology, Jan., 1920, 11, No. 1. — At the twenty-eighth annual meeting of the American Psychological Association several papers were presented that are of interest to the industrial psychologist: *A Comparison of Motor Tests with Estimates of Character, Mental Test Scores, and University Grades; The Average Mental Age of Adults; What Industry Wants and Does not Want from Psychology; The Extension of Rating Scale Theory and Technique; Recent Development in Trade Test Theory; Changes in Some of our Conceptions and Practices of Personnel.* — G. E. Partridge.

The Use of Psychological and Trade Tests in a Scheme for the Vocational Training of Disabled Men. *R. S. Roberts.* Jour. Educational Psychology, Feb., 1920, 11, No. 2, 101–108. — Psychological and trade tests in vocational guidance may be divided, with some overlapping, into two groups: (1) tests to select persons for particular kinds of work; (2) tests to select a definite kind of work for the person to be trained. The first is comparatively simple, because, when there is a position to be filled, the employer has only to determine the degree to which each applicant possesses the necessary qualifications. The second problem is vastly more difficult. The problem of training men for positions where they can accomplish most for society and attain the greatest happiness for themselves is, however, highly important, and can be solved only by workers trained in ability to interpret mental processes. Intelligence tests, trade tests, and expert interviewing are the main methods to be used. — G. E. Partridge.

A Brief Group Scale of Intelligence for Use in School Surveys. *S. L. Pressey.*

Jour. Educational Psychology, Feb., 1920, 11, No. 2, 89–100. — The article is of interest as one of the large number of recent studies of intelligence. It offers suggestions for the simplification of mental tests. The tests given are four in number, each having twenty-five items, thus allowing numerical treatment on a scale of 0 to 100. The reliability of the scale is tested by the method of multiple correlation. — G. E. Partridge.

PERSONNEL AND EMPLOYMENT ORGANIZATIONS OF COSDEN AND COMPANY. Nat. Assn. Corporation Schools Bull., Aug., 1920, 7, No. 8, 351–356. — The article contains a useful table showing the functions of the employment department in accordance with the Federal Board for Vocational Education. It includes also a list of personnel activities as worked out by the employment department of Cosden and Company. — G. E. Partridge.

INDUSTRIAL SERVICE AND MUTUAL BENEFIT ASSOCIATIONS

A SURVEY OF PERSONNEL ACTIVITIES OF MEMBER COMPANIES. Nat. Assn. Corporation Schools Bull., Aug., 1920, 7, No. 8, 346–350. — One hundred and fifty-seven firms have contributed to this report. Returns in regard to various types of activity are summarized and presented numerically, showing the number of firms adopting each form. Job analysis is found in fifty-eight cases. Psychological tests are given by nineteen firms. Educational plans are very generally mentioned. Safety provisions, health activities, thrift plans, musical activities, and welfare provisions are found in great variety. Employment representation, on the other hand, is infrequently mentioned, and appears most often in the form of the welfare committee. — G. E. Partridge.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

LABOR LEGISLATION IN MASSACHUSETTS, 1915 TO 1919 INCLUSIVE. Commonwealth of Massachusetts, Bur. Statis., Nov. 1, 1919. — The topics include: employment and unemployment, industrial safety, industrial sanitation, women and children, industrial education, Sunday labor and weekly days of rest, housing of working people, workmen's compensation and industrial insurance. — G. E. Partridge.

COURT DECISIONS ON WORKMEN'S COMPENSATION LAW, JUNE, 1918–DECEMBER, 1919. New York State Dept. Labor, Special Bull. No. 97, Jan., 1920, pp. 278. — This bulletin, devoted to court decisions on workmen's compensation law from June, 1918–December, 1919, contains sections on the nature of accidents, hazardous employments, and other questions relating to compensation, and includes reports of cases. — G. E. Partridge.

COMPULSORY HEALTH INSURANCE, STATE MEDICINE, OR WHAT? *Hugh Cabot.* Mod. Med., Aug., 1920, 2, No. 8, 533–538. — Among the defects which the writer points to as existing in the present tendency in compulsory health insurance are the following: (1) All members of the community are not benefited by such a system in that it usually applies only to industrial workers; (2) health insurance plans do not effectively provide for the prevention of disease; (3) there is evidence in existing plans that they promote second rate methods of practice; charge allowances are low, and consequently mediocre service is obtained; (4) a more serious objection is that the method of "pill peddling" is encouraged and frequent visits with inadequate equipment for full diagnosis tend to become a common practice; (5) the reaction upon the whole profession is unfortunate so that its ethics suffer.

The ill-defined term "state medicine" seems often to be intended to convey the idea that the state shall assume the responsibility for paying salaries of all physicians. The writer feels that such a plan has no reasonable basis, and that in general it is not taken seriously. He does feel, however, that the state is vitally responsible in many phases of medicine. Its interest in preventive medicine should be continued.

Following the idea in still another direction, the possibility of community participation in medical service presents many favorable aspects. Although industrial medicine has ac-

complished a great deal in recent years, it has certain disadvantages, such as the objection that it limits the right of choice of the individual. Any satisfactory scheme for a public medical service must be based upon the following requirements: (1) Every member of the community shall have satisfactory medical treatment "without requiring him to accept charity or go into debt"; (2) a reasonable freedom of choice must be allowed the individual as to the medical service which will be rendered him; (3) the cost of such service must be distributed so that it will not be a burden on anyone; (4) community medical service must not retard the development of the science and art of medicine.

The writer sees the possibility of the present community center offering a starting point for the development of community medicine. In its simplest form the community center provides a director of health whose chief duties are to co-ordinate existing activities, eliminate duplication, and promote efficiency. A step beyond this plan leads to the development of a staff of physicians whose activities will keep them thoroughly in touch with the community.

In following the idea still further, the community hospital becomes the point from which the activities of the health director will radiate. A scheme involving such an institution with its accompanying organization seems to imply a relatively small community or properly defined units of a large community. Such a hospital should be adequate to care for the average number of sick in the community and in surrounding districts dependent upon it. This hospital might well be under the control of a hospital board which would furnish its services without remuneration. As an adjunct to the work of a community hospital in a district where the population was considerably scattered, stations could be established which would be under the direction of physicians placed there by the hospital. Their work would be to furnish assistance and to direct the people to the facilities available at the central hospital.

The expense of such a scheme undoubtedly would be large. The writer suggests the possibility that many physicians would be willing to co-operate in such a community activity devoting only a portion of their time to the hospital work and the rest of it to private practice among those who did not care to avail themselves of community medical facilities. — C. H. Paull.

Compulsory Health Insurance. Il Lavoro, June 30, 1920, 12, No. 2, 54–60. — The law providing for compulsory health and old age insurance went into effect July 1, 1920. Briefly stated, its provisions are as follows: Insurance is compulsory for persons of both sexes between the ages of 15 and 65 who are employed for wages, and also for tenant farmers and *metayers*, *i. e.*, peasants working land on half shares. Those are exempt who belong to the wage-earning class but have an income over 350 lira a month, also tenant farmers and *metayers* when the income of one member of the family is over 3600 a year. Exceptions are made in favor of certain classes of insurance which were in force before the passage of the act. The insurance seems to be paid exclusively by the employer. All employers of labor by the day, or on contract, or by the job, also all contractors and subcontractors of public work, are obliged to insure their workers. Tenant farmers, although themselves insured under another section of the act, are responsible for insuring any who work for them except members of their families. No insurance is paid for illness lasting less than seven days, nor for illness during which full wages have been paid. The system of benefits is difficult to understand, but payments seem to be computed on the duration of illness and of military service — in the European war only — taken together, one lira being paid for each fortnight of illness and of service. In order to obtain sickness insurance a minimum of 120 fortnightly payments must have been made, for old age insurance, a minimum of 240. However, for the first period, 1920 to 1924, only twenty-four payments will be necessary for sickness insurance and those who on January 1, 1920 were between 55 and 65 years old may receive old age insurance after 120 payments. In case of the death of the insured before his right to a pension has matured, his widow or his children under 15 years of age receive 50 lira a month for six months. Voluntary insurance is allowed under the act for those not covered by its provisions. Insurance seems to be carried by two public bodies, by the Cassa Nazionale delle Assicurazioni Sociali and by thirty-seven provincial institutes recently created by the Ministry of Commerce and Labor. Representatives of insurers and insured have place on the administrative council of the Cassa and on the directories of the provincial institutes. — A. Hamilton.

REHABILITATION OF DISABLED EMPLOYEES

Rehabilitation for Industrial Cripples. *Irene S. Chubb.* Am. Labor Legis. Rev., June, 1920, 10, No. 2, 125–126. — This is a brief statement on the progress of rehabilitation legislation in various states. Up to 1920, ten states had taken steps to make rehabilitation a function of their compensation commissions. This year, New York and Virginia have taken steps to provide for the rehabilitation of cripples. In New York the industrial commission, the department of health, and the department of education co-operate in carrying out the intent of the rehabilitation law. Financial aid up to $10 per week, as well as schooling, is provided. Part of the funds for carrying on the work is derived from an assessment of $900 upon industries in each case of death where there is no person entitled to compensation.

State plans will in the future receive financial assistance from federal funds provided by the Fess-Kenyon bill. — C. H. Paull.

INDUSTRIAL MORTALITY AND MORBIDITY STATISTICS

Coal-Mine Fatalities in the United States in 1919 and Coal-Mine Statistics Supplementing Those Published in Bulletin 115. *Albert H. Fay.* (Including a list of permissible explosives, lamps and motors tested prior to January 31, 1920.) U. S. Bur. Mines, Bull. 196, Feb., 1920, pp. 86. — In addition to giving monthly fatality tables for 1919, this report includes several tables that were published in various monthly statements since 1914, thus making available in one publication all of the data compiled since that time. — M. C. Shorley.

The Mortality of Locomotive Engineers. *Hans Guradze* and *Wilhelm Sternberg.* Zentralbl. f. Gewerbehyg., Dec., 1919, 7, No. 12, 211–213. — Of 635 deaths during the period from 1913–1918, 19.68 per cent. of the deaths recorded were persons from 30 to 35 years of age; 16.38 per cent. were from 40 to 45. If the tabulation is arranged according to length of service, the fact appears that 18.45 per cent. died within ten to fifteen years. Only a few reached an age of service to which pensions were awarded. — M. D. Ring.

Causes of Death of Locomotive Engineers. *Hans Guradze* and *Wilhelm Sternberg.* Zentralbl. f. Gewerbehyg., March, 1920, 8, No. 3, 50–52. — This article is a summary of the causes of death of members of the Society of German Locomotive Engineers from 1913–1917.

Because of war enlistment, the largest number of deaths, namely 137, or 21.6 per cent., fall into the class of mortality due to outside agencies. Four out of these 137 cases were suicides. Heart disease caused 10.7 per cent. of the deaths; 10.5 per cent. resulted from pulmonary or laryngeal phthisis, a typical occupational disease of these workers; and 10.2 per cent. were the result of pneumonia. Only ten of the 635 cases recorded were listed as due to neurosis. Although this is a common malady among engineers, death usually results directly from other causes. — M. D. Ring.

ABSTRACT OF THE LITERATURE

OF

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SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

RESPIRATORY SYSTEM

REPORT OF A CASE SHOWING THE RELATION BETWEEN OCCUPATION AND A CERTAIN CASE OF BRONCHIAL ASTHMA. *Jacob Rosenbloom.* Am. Jour. Med. Sc., Sept., 1920, 160, 414. — The case is reported to show the relation of the occupation to the disease. The man, 44 years of age, had been a baker for twenty-six years but the duration of the asthma was only fourteen years. By skin tests he was shown to be sensitive to the proteins of rye and wheat with which he was working constantly. The author then quotes the cases reported by I. C. Walker in showing the relation of occupation to cases of true bronchial asthma developing in adults. Three methods of treatment are given: (1) Remove the offending protein; (2) change the protein by submitting it to high heat; and (3) desensitization by means of increasing amounts of the protein. — J. T. Wearn.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

COMPOSITE INDUSTRIAL POISONS: A REVIEW. *William H. Rand.* U. S. Bur. Labor Statis., Month. Labor Rev., Feb., 1920, 10, No. 2, 176–197. — This article is a review of a series of papers by Dr. J. Mueller which were printed April to August, 1919, in the *Zentralblatt für Gewerbehygiene.* The author brings out the importance of combinations of substances used in industry as causative factors in industrial poisoning and cites Buergi who has shown that the variable effects of mixed poisons depend on several factors:

"1. Mixtures of two substances may yield a new chemical body.

"2. The solubility of one substance may be modified by the addition of another.

"3. The penetrability of the cell membranes by one substance may be affected by the addition of another.

"4. The cell becomes by saturation with one substance more or less absorptive of another."

A table is reprinted from one of Dr. Johann Mueller's articles in which are listed numerous industries and their peculiar processes in which workmen are subjected to the influence of multiple toxic agents. This list is most comprehensive and valuable.

A discussion of acetylene gas poisoning is

carefully developed and here again the effects of multiple poisons are described and personal case histories are related.

The importance of alcohol as an industrial poison may be regarded from three points of view:

1. The purely physico-chemical action: changes in surface tension of watery solution and solubility of fats.

2. Functional disturbances. By its paralyzing influence on all vital reactions, it reduces the normal resistance of the system.

3. Anatomical changes as a result of irreversible processes.

The reasons for the increase in the number of mixed industrial poisons are pointed out, as are also the difficulties in the recognition of mixed poisons. — L. Greenburg.

Recent Experiences on Industrial Poisoning. *Koelsch.* Abstracted as follows from Z. angew. Chem., 1920, 33, No. 1, 1–5, in Chem. Abstr., July 10, 1920, 14, No. 13, 2033–2034. — "A discussion of the general conditions resulting in poisoning is followed by an account of the symptoms and diagnosis of poisoning by alcohol, Pb, Hg, with its fulminate and chloride, As and AsH_3, oxides of Mn, mineral acids, nitrous fumes, CCl_4, tetrachlorethane, trichlorethylene, amyl acetate, HCN, cyanamide, C_6H_6 and its nitro derivatives, trinitrotoluene, tetranitromethane, trinitranisole, and amino derivatives of C_6H_6." — W. O. Fenn.

Poisoning by Arseniuretted Hydrogen. *T. H. Wignall.* Brit. Med. Jour., June 19, 1920, 1, No. 3103, 826. — The author mentions the fact that the textbooks do not give definite facts as to the minimal quantities of this gas capable of causing rapid death by toxemia, and then quotes Rambousek from Dr. Alice Hamilton's monograph, *Hygienic Control of the Aniline Dye Industry in Europe*, as authority for the statement that the hundredth part of a milligram of arsenic taken in the form of arseniuretted hydrogen is rapidly fatal for human beings. The gas is chiefly met with by the workers on processes in which nascent hydrogen is liberated or in which hydrogen is used as a gas — by lead burners or for the inflation of balloons; also where hydrogen is derived from the interaction of a metal with an acid or alkali. One or both may contain large amounts of arsenic and under these conditions the hydrogen may be contaminated by arseniuretted hydrogen. Certain reductions of the benzene derivatives also liberate the gas.

The signs and symptoms of poisoning with arseniuretted hydrogen are given and five cases are reported. From the amounts of arsenic in the urine of these patients during their stay in the hospital, and from the fact that all the cases recovered, the author concludes that a far greater amount of this gas may be taken by inhalation without causing death than has hitherto been believed. — J. T. Wearn.

Industrial Poisoning from Hydrogen Arsenide. *F. Koelsch.* Zentralbl. f. Gewerbehyg., July, 1920, 8, No. 7, 121–126. — Hydrogen arsenide (AsH_3) is a colorless gas with an odor like garlic. Industrial poisoning from this gas is usually caused by the action of an acid on a metal if one or both of them contain arsenic as an impurity. Traces of hydrogen arsenide may be found in all hydrogen gas used in industry unless it is produced by electrolysis. One hundred and sixteen cases of hydrogen arsenide poisoning are reported in the German literature and are traced to the chemical and metallurgical industry with 64 cases, laboratories with 14, making balloons with 22, and toy balloons, 16. To these Koelsch adds three hitherto unpublished cases from the chemical industry and eleven from a single metallurgical plant, in which vanadium iron is produced for the steel industry. The ore from southwest Germany (Monthranit) contains 6 per cent. vanadium, 30 per cent. lead, 9 per cent. copper, and 0.3 per cent. arsenic. It is leached out with sulphuric acid and for three years the process was carried on without any accidents, but suddenly, for some unknown cause, hydrogen arsenide was formed and, out of fifteen men employed in the room in which this process was carried out, eleven were poisoned, one fatally. No odor of garlic was perceived in the room — a phenomenon which has been noted before in cases where there was a strong concentration of the gas.

According to recent investigations by Joachimoglu, the fatal dose of hydrogen arsenide for man is about 0.1 to 0.15 gm. The concentration is, of course, of importance. Dubitzki says the danger begins when the air contains 0.05 parts per thousand and that 0.03 parts per thousand will produce poisoning after several hours. The symptoms in most of his cases came on some hours after the inhalation of the gas and in the lighter form they consisted only in headache

and nausea. More pronounced cases were characterized by exhaustion, dizziness, nausea, pressure in the epigastric region, vomiting, distention of the abdomen, diarrhea, and, after a couple of days, jaundice. Paresthesias and neuralgias were complained of in some cases. The urine for several days showed blood and bile coloring matters and the recovery was slow. The diagnosis of acute gastritis was made at first and only the number of men affected aroused the suspicion of a poison. This suspicion was strengthened by the appearance of the urine which was of clear dark red color and contained abundant albumin. A typical case was that of the industrial chemist who worked all day in the atmosphere of fumes and the next day awoke with a feeling of confusion, pains in the kidney region, was slightly jaundiced and had two attacks of unconsciousness during the day. The urine was like red wine and the color persisted for eight days. During the same time there was extreme weakness, especially in the legs, and rheumatoid pains in the arms and fingers. The autopsy findings in the fatal case were very characteristic: general icterus and icteric staining of all organs and fluids; enlargement of the spleen and of the liver, the latter showing slight fatty degeneration; gall bladder full of thick dark bile. Microscopic examination of the kidneys showed plugging of the convoluted and straight tubules with hemoglobin and fragments of red corpuscles. The circulating blood had undergone a slight degree of hemolysis.

Hydrogen arsenide poisoning must be differentiated from acute poisoning with the nitro and amido derivatives of benzene by the absence of methemoglobin formation and of cyanosis. Jaundice and blood in the urine point strongly to hydrogen arsenide poisoning; so do severe headache, tendency to fainting, and severe digestive disturbances with jaundice, even before blood appears in the urine. It is, according to Kobert, the only important industrial poisoning belonging to the hemolytic group. The treatment is based on efforts to restore the deficient oxygen by repeated administrations of oxygen inhalation kept up for days and sometimes weeks. Prevention means removal of the poisonous fumes or closed apparatus making their escape impossible. The fact that hydrogen arsenide colors mercuric chloride yellow makes it possible to detect small quantities of this gas by means of filter paper wet in mercuric chloride solution. — A. Hamilton.

Poisoning by Arsine. *M. Bannister.* Brit. Med. Jour., Sept. 25, 1920, 2, No. 3117, 470. — The author reports a fatal case of poisoning from the inhalation of arsine, produced during the manufacture of zinc chloride by treating in stone tanks "zinc ashes" and "flux skimmings," residues in the zinc galvanizing process, with commercial hydrochloric acid. As the gases are freely given off, the men are provided with masks and instructed to leave the tank as soon as the charge has been emptied into it. In the case reported, it was observed that the man did not go away from the tank after the gases began to come off, but remained at the side of it leaning upon his spade. He began to develop signs and symptoms of arsenic poisoning that evening and died four days later. A postmortem examination was made and the hair, liver, kidney and stomach were shown by chemical analysis to contain arsenic. On analyzing the materials used in the chemical process it was found that the commercial hydrochloric acid, the "zinc ashes" and the "flux skimmings" contained arsenic. The dangerous character of the gas is pointed out by the fact that the man apparently absorbed a fatal dose of the gas before he felt inconvenience from it.— J. T. Wearn.

Chronic Poisoning by Arsenic in Sweden. *Vittore Ravizza.* Abstracted from Giorn. chim. ind. ed applicata, 1920, 2, 189–190, by R. S. Posmontier in Chem. Abstr., Sept. 10, 1920, 14, No. 17, 2661. — "The general fear existing in Sweden of chronic poisoning by As has no serious foundation. The possible volatile As compounds (AsH_3 and others) occurring in rooms as exhalations of paints containing As are of a concentration 1/700 of that which would begin to cause any change in the blood, not necessarily poisoning. For one thing the employment of old analytical methods for determining As is responsible for the widespread fear. Results obtained by accurate analysis showed that in many cases two-thirds to one-sixth as much As was found as was indicated by the old official methods, and often no As was found at all where the official methods indicated it." — W. O. Fenn.

Industrial Poisoning by Fumes of Hydrocyanic Acid. *F. Koelsch.* Zentralbl. f. Gewerbehyg., May, 1920, 8, No. 5, 93–95; June, 1920, 8, No. 6, 101–105. — Hydrocyanic

acid is a colorless liquid with an odor of bitter almonds, boiling at 27° C. and therefore extraordinarily volatile. According to the literature, industrial poisoning from this compound and from other cyan compounds is extremely rare. Lehmann says that absorption takes place rapidly through the skin and that even the fumes may pass through the skin. Small quantities of hydrocyanic fumes are, therefore, produced when nitrogenous organic substances undergo incomplete combustion in illuminating gas, in smoke from burning celluloid, etc.; in the production and use of the ferro- and ferricyanides for colors, of the metallic cyanides in galvano-plating; in recovering and working with gold; and in removing the hair from skins by the use of residue from gas works. More serious exposure has occurred in the chemical industry and in the burning of large quantities of celluloid. Hydrocyanic acid was used for a while in gas warfare and endangered the men who produced and loaded it.

There is only one fatal case on record from the inhalation of hydrocyanic acid in the course of its preparation, but a similar case is reported in a woman who carried a jar of potassium cyanide solution down a flight of stairs and was fatally poisoned by inhaling the fumes.

Just recently hydrocyanic acid has come into extended use for the destruction of vermin. This use has existed in America since 1886, but in Germany only recently in order to get rid of lice and other insects. This innovation is of importance for the industrial hygienist because it endangers not only the persons engaged in disinfection, but also those who have to work in the disinfected premises. The usual method is to bring about evolution of hydrocyanic acid fumes with dilute sulphuric acid and sodium cyanide. The gas begins to come off immediately so that great precautions must be taken. The disinfectors are instructed to drop the package of sodium cyanide, paper and all, into the acid, and run. In a building of several stories the disinfection must begin on the top story and in the room farthest from the stairway. After the doors are closed they must be sealed and warning signs placed on the outside. The action of the gas is complete in two hours, but usually the building is left overnight. The doors and windows must be opened from the outside, and when this is impossible an oxygen helmet must be used. From half an hour to two hours' ventilation is long enough for the disappearance of the gas, but the apparatus in which it has been generated must be removed with great care, as was shown by the first fatal case of poisoning from this source in Germany, reported in 1917. Two men went in to carry out the receptacle in which the gas had been produced. As they lifted it, an unchanged portion of sodium cyanide was brought in contact with the acid and the fumes that developed poisoned the workman who was carrying the rear handles of the apparatus. He died in a short time. The second accident occurred in a lodging house for the Krupp workmen at Essen. Ten men who went into the disinfected rooms too soon were fatally poisoned, and five more were overcome but recovered.

The symptoms in these acute cases are — when the quantity inhaled is small — dizziness, choking, and dyspnea, irritation in nose and throat, injection of the conjunctiva, burning sensation on the tongue, loss of appetite, vomiting. There may be a sense of pressure in the frontal region and a sense of fear, which is a warning of oncoming loss of consciousness. Tintemann has reported nephritis lasting nine days, with albuminuria. Other sequelae are disturbances of circulation, rapid arythmic heart beat, general weakness, with dizziness, fainting, insomnia. A larger dose of the gas brings about sudden collapse with deep coma lasting for hours, convulsive twitchings, difficult, irregular breathing, pulse hardly perceptible, widely dilated pupils, death.

Chronic poisoning, the real industrial form, seems to be very rare. Apparently it has not been observed at all in a great gold and silver refinery in Frankfurt am Main, in which a weak solution of hydrocyanic acid has long been used. Very small quantities of this acid seem harmless, probably because it takes up sulphur in the body and is changed to the nontoxic sulphocyanogen. A few cases of subacute or chronic poisoning have been described. Chanet described cases among workers in a galvanizing factory where the air smelled strongly of bitter almonds, and Merzbach found such a case in silver plating. The man had breathed very small quantities of hydrocyanic acid for thirteen years. Koelsch has himself been unable to discover any disturbance of health in the factories he has visited. According to those who have described chronic cases of poisoning, the symptoms consist in headache, roaring in the ears, dizziness, a feeling of weakness, burning in the throat, dyspnea, and palpitation of the heart. Animal experi-

ments seem to show that it is impossible to bring about tolerance to the gas.

Koelsch has observed among men employed over galvanizing tubs an affection of the skin of the face, which is apparently typical acne rosacea, and he attributes it to an irritation of the vasomotor nerves of the face, resulting in an angioneurotic inflammation like that produced by alcohol. The pathology of hydrocyanic acid is essentially an "internal suffocation" brought about by the formation of cyanhemoglobin, the interference with normal oxygen supply to the body cells, and a simultaneous paralysis of the central nervous system, especially of the center of respiration. The effect is apparently cumulative. The poison is partly excreted unchanged through the lungs and sweat, and traces are found in the urine. According to Lehmann's experiments, hydrocyanic acid is fatal in one-half to one hour when present in the proportion of 0.3 to 0.12 mg. in a liter of air.

Koelsch has tested with Schönbein's reagent the air over galvanizing tubs and has obtained positive results, as also from the fine dust on the floor and other surfaces. Nevertheless, in those very places there was no evidence of harm resulting from the presence of the gas which was probably well under 0.02 mg. per liter. Such quantities, he believes, are negligible. He concludes with a consideration of the regulations recently passed in Germany to prevent accidents from the use of this gas as a disinfectant. The German government has given the control of this procedure to the German Society for the Prevention of Accidents. As to the treatment of severe poisoning from hydrocyanic acid, he advises inhalation of oxygen with artificial respiration, injection of suprarenin and perhaps atropin, and washing out the stomach with hydrogen peroxide. In order to help nature to bring about the change to the harmless sulphur compound, it may be well to inject subcutaneously a 5 per cent. solution of sodium thiosulphate. The prognosis is good after the first hour, for the man who does not die in the first hour is likely to live. — A. Hamilton.

Harmful Effects of Blast Furnace Gas. *Derdack.* Zentralbl. f. Gewerbehyg., May, 1920, 8, No. 5, 90. — In a large smelter in the Saar basin, a number of accidents have recently happened which were traced to the breathing of purified blast furnace gases, and which were characterized by very peculiar symptoms. The men lost consciousness but were revived by the administration of oxygen. They gradually recovered their general health but a permanent mental impairment remained, which eventually led to their removal to the insane asylum. Several months have elapsed since then without any improvement in their mental condition. According to the management of the smelter, accidents of this sort never occurred until dry purification of the blast furnace gas was introduced in place of the former washing. Therefore, they believe that the dry method of purification must result in the presence of certain poisonous gases which were not formed in the course of washing — perhaps arsenical or cyanogen compounds. — A. Hamilton.

Observations on the Toxicity of Coal Tar Dyes in Industry. *Bachfeld.* Zentralbl. f. Gewerbehyg., July, 1920, 8, No. 7, 113–121; Aug., 1920, 8, No. 8, 149–158. — Bachfeld considers only the toxic effect of coal tar colors on the men manufacturing them, and discusses two possible effects — diseases of the skin, and inflammation of the eye following the entrance of a foreign particle. He bases his conclusions on a six-year experience as industrial physician in a color factory in Offenbach. During these six years there were 159 cases of skin disease, thirty-two of them resulting in disability and loss of time. The number of men exposed was 4945. In order to discover whether their occupation had anything to do with the skin lesions, he grouped the employees into those who handled crudes and intermediates, the color makers, the men handling finished colors, and those exposed to neither colors nor intermediates. The proportion of skin lesions was highest in the color makers, with 3 to 4 per cent.; next in the department of crudes and intermediates, with 2 to 3 per cent.; then the finished colors, less than 1 per cent.; and finally, the fourth group, with 0.28 per cent.

Weyl has classed ninety-six coal tar colors as poisonous. These belong to the following classes: nitro colors, triphenyl and diphenylmethane colors, acridin, oxazin, and thiobenzyl colors. Twenty-four of these are produced in the Offenbach factory but none has shown itself to be toxic. Only two cases of skin disease could be clearly connected with the handling of colors; one, with sulphur black, and the other, with *Echtmarineblau.*

That the finished colors are harmless has been shown repeatedly by practical experience in this factory. Workmen who cannot stand exposure to the crudes and intermediates, who complain of headache and loss of appetite, and are anemic and weak, are transferred to the color department as a routine practice. Indeed, their experience is that the farther the process is from the crude stage, the less the toxicity of the product. The addition of acid and methyl radicles lessens toxicity greatly. Martius yellow or Manchester yellow, which is dinitronaphthol, is poisonous, but the calcium or sodium or ammonium salt of dinitronaphtholsulphonic acid is non-toxic. Metanil yellow and Orange II are exceptions to this rule, for in spite of the entrance of a sulpho group they are distinctly toxic.

Bachfeld has seen eczema and irritation of the mucous membrane caused by New Blue R or *Echtmarineblau*. The powder only is irritating, not the solution. Cases of skin disease that arose in the azo color department he attributes to the benzidin and tolidin, rather than to the colors. Seven cases in the fuchsin department were probably due more to the purification agents than to the finished color. The production of methyl violet gave some trouble and in the alizarin department there were six cases of skin disease, but none of them could be traced to the colors themselves. An individual idiosyncrasy had evidently much to do with all of these cases, for a great majority of the workmen remained unaffected by the irritating compounds.

As to the effect on the eye, the question was whether a bit of color dust acted in any way differently from an inert foreign body. It was evident from the records that the department of finished colors had the greatest proportion of eye accidents resulting in disability. Forty-three cases were reported from this department and the colors responsible were triphenylmethane dyes and one oxazin dye. Methyl violet and methyl green were responsible for the greatest number of cases — a fact which is explained by the dust-producing methods in use in this department. There was no evidence that the injury done by the color dust was any greater than that produced by inert foreign bodies in other departments. Bachfeld is unable to explain the unfavorable experience of other physicians, such as Wagenmann in Graefe's Handbook of Ophthalmology, unless it be that the workmen, frightened by the strange look of the dye on the eyeball, used such energetic and inappropriate methods to get rid of it as to infect their eyes. — A. Hamilton.

Recognition and Treatment of Tumors of the Bladder in Aniline Workers. *Rudolph Oppenheimer.* Zentralbl. f. Gewerbehyg., June, 1920, 8, No. 6, 105–107. — Success in treating aniline tumors is dependent on their early recognition, therefore routine examination of the urine in suspected cases is highly important. The urine should be voided in two portions, and the second half examined for red blood cells, for their presence, although not a specific sign of bladder tumor, is very common in the early stages and may appear before the cystoscope reveals the tumor. If the cases are discovered early, it is often possible to keep the men for years in good health and to prevent the change of a benign tumor to a malignant form. In case of malignancy the bladder must be opened and the tumor removed. But non-malignant growths favorably situated and not too large are better handled by electrode or snare, which after repeated applications results in the removal of the tumor without surgical interference. Six cases of this sort were operated on in this way by Oppenheimer and five are still at work. The sixth had to be operated on two years later for a cancerous growth. — A. Hamilton.

Industrial Blood Poisons. *C. R. Newton.* Jour. Am. Med. Assn., April 24, 1920, 74, No. 17, 1149–1150. — The writer reports very briefly upon the blood picture in three cases of benzene poisoning, one of benzene-aniline mixed poisoning, and three of aniline poisoning, which he had the opportunity to study during the war. He also made observations upon ten subjects exposed to the possibility of benzene poisoning for periods varying from one week to five and a half years to determine whether there was any cumulative effect. His conclusions are as follows:

"1. Workers chronically exposed to benzene may show leukopenia without any other symptoms, and make complete recovery.

"2. Acute exposure to anilin and nitrobenzene vapors produced cyanosis with destruction of the red blood corpuscles, but with little change in the white corpuscles, with recovery. In one case in which free benzene was presumably present, there was destruction of white

cells without appreciable destruction of red cells, and a more rapid recovery, that is, in three days.

"3. The maximum white cell destruction by benzene, and the maximum red cell destruction by anilin-nitrobenzene, may not be reached for several hours after the onset of the symptoms.

"4. Workers exposed for long periods to benzene may not have a leukopenia; apparently, therefore, the action is not cumulative." — C. K. Drinker.

THE FATE OF BETA-NAPHTHYLAMINE IN THE ORGANISM OF THE DOG. *Engel.* Zentralbl. f. Gewerbehyg., May, 1920, 8, No. 5, 81–86. — The author is attached to the great dye works at Ludwigshafen. He discusses the etiology of tumors of the bladder in aniline workers and refers to the communication made before the Congress of Industrial Physicians in 1913, which emphasized the importance of studying those compounds apparently responsible for this industrial disease. Leuenberger at that time expressed the view that the amido compounds, which are probably the causative agents, undergo hydrolysis (introduction of the HO radicle into the ring) in the organism and that it would be well to find out whether it is possible to group the amido compounds according to the form in which they are eliminated and see whether these findings can be brought into any agreement with the clinical and industrial history of the actual cases. Leuenberger believed that the localization of the tumors in the bladder pointed to the action of some elimination product and that, in all probability, the product was an hydroxyl derivative of an amido compound. Engel remarks, however, that there are some striking exceptions to this statement. Thus, diphenylamine undergoes complete loss of its amido group, while two even more important compounds, paratoluidin and alpha-naphthylamine, are excreted unchanged. The same is true to a certain extent of aniline. We must reckon, therefore, with the possibility that we have to do not only with typical hydroxyl elimination products but also with other intermediates or perhaps with the unchanged amido compounds themselves.

Engel selected beta-naphthylamine for his experiments because a conspicuously large number of cases of bladder tumor have arisen in connection with the handling of this substance — a fact which is all the more surprising because there is nothing about its production or use which renders work with this compound unusually hazardous nor is it particularly volatile. Engel undertook to determine whether beta-naphthylamine undergoes hydrolysis and whether there is also the formation of such bodies as amido naphthol or amido dioxynaphthaline and finally, whether these latter undergo before elimination conjugation with ether sulphuric acid or glycuronic acid. He selected dogs as his subjects, made preliminary estimates of the ether sulphuric acid and glycuronic acid excreted in twenty-four hours, then administered the beta-naphthylamine subcutaneously. The result was a marked increase in the excretion of ether sulphuric acid and a less marked increase in glycuronic acid, the increase persisting for five or six days. If the dogs were kept on a carbohydrate diet the greater part of the beta-naphthylamine underwent conjugation with the glycuronic acid; on a flesh diet, with the ether sulphuric. The experiments are being continued in order to determine the properties of the decomposition products of beta-naphthylamine in the urine, and similar experiments are also being conducted with alpha-naphthylamine and dimethylaniline. — A. Hamilton.

RECOMMENDATIONS CONCERNING THE MANUFACTURE AND USE OF WOOD ALCOHOL. U. S. Bur. Labor Statis., Month. Labor Rev., Feb., 1920, 10, No. 2, 197–201. — A brief discussion of the uses and physiological effects of wood alcohol is followed by the regulations suggested by the National Committee for the Prevention of Blindness for the uniform control of the use of wood alcohol. — L. Greenburg.

LEAD POISONING AND ITS PREVENTION. *C. P. Tolman.* Abstracted as follows from Proc. Nat. Safety Council, Eighth Ann. Safety Congress, 1919, 448–458, by C. E. Curran in Chem. Abstr., July 20, 1920, 14, No. 14, 2219. — "Methods and devices used in prevention of dust hazards in manufacture of white and red Pb, etc." — W. O. Fenn.

DUST HAZARDS AND THEIR EFFECTS

THE SEPARATION OF DUST FROM THE WASTE GASES OF OVENS FOR THE RECOVERY OF COPPER FROM OLD BRASS. *Tittler.* Zentralbl. f. Gewerbehyg., July, 1920, 8, No. 7, 126–130. — During the war, because of the scarcity of copper, a large amount of old brass was smelted and reduced to black copper. In this process zinc, as zinc oxide and also in vaporous form as metallic zinc, is liberated into the waste gases of the ovens. The vaporous metallic zinc is precipitated as metallic zinc dust as the gas cools, unless it is changed to zinc oxide, and in any case the gases contain quantities of zinc oxide dust, vitiating the air in the vicinity of the works. Most of the plants which have been doing the work of reducing old brass have lacked equipment for separating out the dust, and since many of these plants have been situated in thickly settled districts much trouble has been caused. Means of separating the dust have long been known in smelting circles, however, although they have been developed rather for economic than for sanitary reasons, since the dust has commercial value. Schabel in 1890 showed the necessity of rendering the smelting dust harmless, and since then the technique has been worked out and is now well advanced.

The writer of the present paper has had occasion to make observation of the methods in actual use in a large number of plants which are doing brass smelting. He describes the furnaces that are employed, and gives in some detail an account of processes for still further separating the metallic materials. The gases are conducted through iron pipe systems which are cooled either by air or water. He finds in operation also a process of continuing the purification of the gases by means of filters — a process which is described in detail, including some of the difficulties met in the operation. A centrifugal method is also mentioned. Another method is the separation of the metallic particles by means of the electric current. Experiments were made with this method a good many years ago, both in England and in Germany, and it is said that the system devised by Cottrell is in successful operation in Freiburg.

As a conclusion from all the investigations, the writer asserts that the purification of the gases from the processes under consideration is absolutely necessary. The commonly employed methods of cooling and condensation are not adequate; there must be actual purification of the gases, and this is best accomplished by filtering. Several processes are still in an experimental stage and definite judgments cannot be passed on them. — G. E. Partridge.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

PREVENTION OF ACCIDENTS ON THE ENGLISH RAILWAYS. *Wernekke.* Zentralbl. f. Gewerbehyg., May, 1920, 8, No. 5, 90–93. — The excessive accident rate on American and English railways has given rise in recent years to a definite movement in these countries, first in America, then in England, to prevent such accidents. These efforts are well expressed by the phrases that have been adopted as the watchwords of the movement — "Safety First!" in America, and "Is It Safe?" in England. From these the writer thinks Germany has nothing to learn, although efforts abroad in fields in which the Germans are pioneers and have made the greatest advances, are interesting to observe. He relates the history of the movement that began in England in a measure adopted in 1871, and presents a statistical table showing the number of railway accidents on English roads for the years 1900 to 1915. The figures for the Great Western Road are given for the period from 1910 to 1918, showing that its method of suggestion and reminders to its employees has been relatively successful. Up to 1913, when the campaign against accidents was initiated, the rate had greatly increased; after 1913, there was a marked and continuous decrease. — G. E. Partridge.

ABSTRACT OF THE LITERATURE

OF

INDUSTRIAL HYGIENE

VOLUME II JANUARY, 1921 NUMBER 9

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GENERAL

REPORT OF THE NEW JERSEY DEPARTMENT OF LABOR, JULY 1, 1918–JUNE 30, 1919. Pp. 164. — Among the subjects of interest to the industrial hygienist contained in this report is the complete text of a code of safety standards relating to the use and care of abrasive wheels, prepared by the New Jersey Bureau of Electrical and Mechanical Equipment in conjunction with the joint Safety Committee of the Abrasive Wheels Manufacturers of the United States and Canada and the National Machine Tool Builders' Association.

The report of the Bureau of Hygiene and Sanitation of the Department of Labor emphasizes the importance of proper first-aid and hospital equipment in manufacturing establishments, and illustrates by a number of letters from New Jersey manufacturers the practical working experience of plants where first aid is practiced.

During 1919 the United States Public Health Service conducted a sanitary survey of the pottery industry in New Jersey to determine the risk to health in this industry resulting from the use of lead glazes. A full outline of the purposes and scope of the survey, the processes covered and the method of making the survey is given in this report. The findings of the survey are not given.

Pages 90–92 of the report contain the revised New Jersey standards for the installation of toilet equipment and enclosures in industrial establishments.

A second set of standards contained in the Department of Labor report and of interest to industrial hygienists are the standards for brass and bronze foundries and metal-finishing processes. These standards represent a careful survey of the brass industry in several states and are based on safe practices under which the better type of brass and bronze foundries are conducted.

"During the year ending June 30, 1919, the Industrial Accident Bureau received 31,251 re-

ports of tabulatable accidents, viz., accidents arising out of the employment and resulting in death, permanent disability or in the loss of time in excess of the remainder of the day, turn or shift on which the injury was incurred. There were received in addition to the above number, upwards of 20,000 reports showing only minor injuries and involving no actual loss of time.

"Of the total of 523 fatal and 30,728 non-fatal accidents reported as having occurred to workmen engaged in the four occupational groups into which the compilation is divided, 350 fatal and 17,304 non-fatal accidents are charged to factories and workshops, 57 fatal and 7,084 non-fatal to building and construction, 17 fatal and 205 non-fatal to mines and quarries and 99 fatal and 6,135 non-fatal cases to the miscellaneous group.

". . . Only 54 or 15.4 per cent. of the fatal accidents and 4,907 or 28.3 per cent. of the non-fatal accidents were attributable to mechanical power, and of this number power working machines were responsible for 8 fatal and 3,019 non-fatal accidents. This analysis does not warrant the general inclination to associate industrial hazard almost exclusively with mechanical causes.

"Explosions of powder and dynamite, with 120 fatalities, 76 of which resulted from" one explosion, "were the greatest single cause of fatal accidents, closely followed by falls of persons with a total of 35, sixteen of which were due to falls from scaffolds, ladders, etc.; cranes with a total of 30 and hot substances, fire, chemicals, etc., with a total of 25 fatalities.

"Handling objects accountable for 3,025 or 17.48 per cent., power working machines with a total of 3,019 or 17.45 per cent. and falling objects not being handled with a total of 2,580 or 14.91 per cent. were the causes of the greatest number of the non-fatal accidents.

". . . Of the total number of accidents, fatal and non-fatal, in all industries, 26.42 per cent. occurred in metal working, 23.03 per cent. in shipbuilding and woodworking, 12.83 per cent. in chemicals and 10.63 per cent. in machinery industries.

"The necessity of having all injuries, no matter how apparently slight, reported and treated immediately, is evident from" a "table which shows that there were 1,738 cases of infection following injuries. Six of these cases resulted fatally and three caused the loss of a finger.

"Injuries to the eye resulted in 9.91 per cent. of the non-fatal accidents in factories and workshops.

"The Industrial Accident Bureau has continued the issuing of monthly bulletins in which the accidents of the previous month are analyzed as to their causes, results and the industries in which they occur. In addition to our accident statistics bringing to the attention of our safety engineers and factory inspectors the risk hazards of industry, they have become a very interesting and valuable source of information to the members of the Rehabilitation Commission in their study of economic consequences of permanent injuries suffered by industrial workers in the state."

The Division of Industrial Information of the Bureau of Industrial Statistics is establishing an industrial safety museum which will serve as a clearing house for the standardization of environment factors in productive industry. The "especial object of this Industrial Safety Museum is to provide facilities for the employers of the state, in their efforts to learn of the most practical methods used by their industrial competitors in reducing the labor turnover and stabilizing industrial relations.

"The department believes that — basic questions of wages and hours aside — a large percentage of unrest and inefficiency in the factory is due to working handicaps. It has, therefore, for the past five years, been gathering data throughout the country concerning successful production standards in our leading industries. At the museum it will handle all phases of the stabilizing of the labor force, covering the following divisions by means of physical exhibits, machinery, charts, blue prints, and photographs:" (1) accident prevention; (2) first aid; (3) fire hazards; (4) steam boiler hazards; (5) lighting standards; (6) hygiene and sanitation, exhaust ventilation; (7) lunch rooms; (8) structural exhibits; (9) industrial relations including (a) housing, (b) insurance, (c) shop committees, and (d) labor turnover and employment methods; (10) woman and child labor problems; (11) industrial training; (12) library service; and (13) exhibits of production standards. — K. R. Drinker.

Industrial Health Education—A Means and an End. *J. Schevitz.* Am. Jour. Pub. Health, Oct., 1920, 10, No. 10, 780–782. — "If health officers were backed in their work by business men they would no longer worry about inadequate appropriations or political inter-

ference. Business men already know the economy of health in the factory. It is the duty of industrial hygienists to furnish the missing link and educate the business man to the value of bettered public health to his factory and himself." — H. F. Smyth.

A National Institute of Industrial Physiology. Abstracted as follows from Lancet, April 13, 1920, 1, pp. 779–780, by W.D.H. in Physiol. Abstr., Aug., 1920, 5, No. 5, 213. — "In the current number of the *Times Engineering Supplement* a detailed account is given of the proposed National Institute of Psychology and Physiology applied to industry and commerce. . . . The intention of the founders is to establish a national institute which will investigate the human problems of industry and commerce, occupying a position similar to that held in the domain of physical science by the National Physical Laboratory." — McKeen Cattell.

Report of the Committee on Occupational Diseases in the Chemical Trades. *C. Baskerville et al.* Abstracted as follows from Jour. Indust. and Engin. Chem., 1920, 12, pp. 439–440, by L. W. Riggs in Chem. Abstr., July 20, 1920, 14, No. 14, 2230. — "Specifications for goggles for various purposes may be had, on application, from the Bureau of Standards. Immunity from influenza of workers in bromine plants was observed among large producers, while data leading to the opposite conclusion was reported by small producers and users. Reports indicated that people working in the manufacture of illuminating gas, cordite, tin, poison gas, NO_2, SO_2 were much less (one-fifth to one-twenty-fifth) likely to contract influenza. Liberal and deep applications of lanolin to the interior of the nose protects the membrane from infection which causes colds. More research and publicity of an educational nature with reference to industrial hygiene is recommended." — W. O. Fenn.

Why were Half of Our Young Men not Fit for the Fighting Line. *G. R. Cruikshank.* Pub. Health Jour., Aug., 1920, 11, No. 8, 353–355. — The following are points of special interest from Mr. Cruikshank's analysis of 1000 consecutive cases examined for the military draft in an agricultural and sawmill county: Out of 1000, 436 were placed in classes other than A; 75 were rejected on account of defective feet; there were 33 cases of Graves' disease and 7 of simple goitre; probably 6 per cent. of the young men of the county suffered from rheumatic fever; 46 were excluded for tuberculosis; there were 21 cases of general debility; 6 per thousand were excluded for syphilis and 3 per cent. for gonorrhea — this does not however indicate the incidence of these diseases as where there was hope of a quick recovery rejection was not thought necessary. — R. M. Hutton.

Efficiency of Mine Labor as Related to Industrial Medicine. *A. L. Murray.* Mod. Med., Sept., 1920, 2, No. 9, 606–608. — Labor efficiency depends upon many and varied factors, such as proper selection and placement of man power, medical supervision, proper living conditions, the social and moral tone of the community. In the selection of men, there are two main requirements to be kept in mind — physical ability and adaptability. Every man employed by a mining company should be examined physically before being employed, and the information thus gained should be used in the assigning of men to positions. Records kept of such pre-employment examinations by firms employing large numbers of men show that the rejection rate is very low. The reports of one large corporation show that on first examination 7 per cent. were found physically unfit, and that by simple operations and corrective measures three-quarters of the rejected group could finally be employed.

The successful operation of a mine depends as much on supervision of its men as upon the care of its machines and, as a means of increasing efficiency, industrial medicine must be regarded as of prime importance. The waste from preventable disease is at present very great. Popular education in hygiene and similar subjects can be given in mining communities through agencies that may readily be provided. Visiting nurses can give instructions; short talks on health subjects should be given at regular intervals, illustrated, when possible, by lantern slides, motion pictures or charts; first-aid classes should be organized, not only among the men, but among the women and older children of the camp. Clean-up campaigns, anti-fly campaigns, and the like are useful. The medical and surgical care must be the best possible, and especial attention should be paid to slight ailments and injuries. Where practicable a hospital, or at least an emergency room, should be maintained at the mine. At

large mines a safety engineer is as important as a mining engineer. Drinking fountains and sanitary latrines under ground are recognized as necessities, and change houses ought to be provided where the men can bathe and put on clean and dry clothing before going home. Health provisions do not end here, however, but must extend to housing, supervision of boarding places, the perfecting of water supply and sewage systems and the provision of facilities for recreational and social life. — G. E. Partridge.

Social Hygiene in the United States. *P. Popenoe.* Ztschr. f. Sexualwissenschaft, April, 1920, 7, No. 1, 22–31; May, 1920, 7, No. 2, 60–63. — The writer asserts that during the past ten years the whole face of the problem of social hygiene in the United States has changed, and especially since our entrance into the war. One of the greatest factors in our advancement in social hygiene has been the increased control of such evils as prostitution and venereal diseases, an improvement made possible by military authority. The plan by which prostitution is regulated under medical inspection has not proved successful and there are, in fact, many objections to it. One of them is that, because of the nature of the medical work involved, incompetent and irregular practice is possible and hardly to be avoided, and the thoroughly trained man has not been eager to enter the field. Investigations show that there is more disease among the regulated than among the unregulated prostitutes, and the difficulty of segregating the class has been great. Such objections have led to the American plan, the essential feature of which is the belief that suppression is the only cure. There has been an awakening to the gravity of the evils, and a strong effort is being made to stamp out prostitution as the cause of disease. The American plan has the support not only of federal and state authorities but of public opinion as well. The present status of prostitution, in its legal aspects, in the various states of the Union is defined, and the paper contains other useful data. The work of the United States Interdepartmental Social Hygiene Board, of the United States Public Health Service, and of the American Social Hygiene Association is described. The measures taken during the war — prophylactic and other — are mentioned, and the statement is made that the method of prophylaxis has not been so successful in preventing disease as a civilian measure as it has been as a military measure. These problems, we must understand, although they have been focal in the past few years, are only a part and, in a certain sense, a small part of the whole problem of social hygiene. The chief purpose of social hygiene, from the American viewpoint, is the securing of the family as a social unit in such a way as to advance mankind in every possible direction. To that end we must have in mind all the conditions favorable and unfavorable that enter as factors into this problem of the family. Some of these are biological, some are ethical.

In the second part of the paper the American plan for the handling of the problems in question is presented somewhat in the form of an ideal. There are four lines of attack: by legal pressure; by enlightenment and education; by medical measures; and through diversion by recreational means and the like. — G. E. Partridge.

Continuation Classes in England. School and Society, Sept. 18, 1920, 12, No. 299, 233. — Much excellent educational work has already been done in the continuation classes that have been formed under the Educational Act of 1918. Schools have been established providing for seven or eight hours of study each week, and some in which employees attend classes from two to three hours each day. In some cases vocational training is included. In one city fifteen firms have combined to establish a school. — G. E. Partridge.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

Temporary Blindness, with Paralysis of the Eye Muscles Following Carbon Monoxide Poisoning. *G. Abelsdorff.* Deut. med. Wchnschr., Feb. 19, 1920, 46, No. 8, 210.—F. B., gardener's helper, exposed to carbon monoxide from a charcoal stove, became unconscious. Later he vomited, and suffered from malaise, dizziness, and headache for two days. On the fourth day a disturbance of vision set in, which became so bad the next day that he could not

recognize large objects. Physical examination was negative, except for a slight horizontal nystagmus. The urine was negative. No carbon monoxide hemoglobin was found in the blood. There were 4,005,000 red cells and 12,900 white cells. Hemoglobin was 85 per cent. The temperature was normal.

On the sixth day the eyes showed: R—hand movements at 1 m., field of vision contracted almost to the fixation point; L—same, without so much contraction. Both eyes showed complete color blindness. The right pupil was wider than the left, but both reacted. The eye movements were free, except that the right lagged on looking up. The ophthalmoscope showed normal fundi, except for a few old depigmented spots at the periphery of the right retina.

In one week, without medication, the vision became: R—6/20; L—6/25. The fields were concentrically contracted, without scotoma. Bright colors were recognized, but in such a way that it suggested congenital color blindness. A red glass placed over the right eye caused diplopia, characteristic of paresis of the left inferior rectus.

At three weeks the paresis was still present, both pupils were equal, vision was normal, the fields were normal, and the finest print could be read at 1/4 m. At four weeks there was no change.

Abelsdorff could find only one other similar case in the literature. Carbon monoxide poisoning of the eyes usually shows some changes in the fundi, such as venous hyperemia, small retinal exudate, or slight optic neuritis. The failure of vision, in this case, accompanied by bilateral concentric contraction of the visual fields, points to acute intracranial neuritis involving the orbit, in spite of normal fundi, because a single central lesion, like a hemorrhage, could not account for it. The quick recovery also favors this view. — H. G. Noyes.

Lumbar Puncture in Carbon Monoxid Poisoning. *Legry* and *J. Lermoyez.* Abstracted as follows from Bull. de l'Acad. de méd., July 27, 1920, 84, No. 29, 67, by Davis in Arch. Dermat. and Syph., Nov., 1920, 2, No. 5, 657–658. — "In carbon monoxid poisoning the reaction must be thought of more as a corticopial congestive and hemorrhagic process which the intoxication produces than as an intoxication. In a recent case, the writers on their first lumbar puncture found a spinal fluid which appeared like almost pure blood. Such evidence of a hemorrhagic state is not constant in all cases. Lesieur and Rebattu have reported cases with spinal fluid free of all anomaly. Though the patient whose case is cited showed a bloody spinal fluid and serious symptoms, his wife and daughter presented only transitory malaise though subjected to precisely the same exposure to the gas. To explain this peculiarity, the authors mention the writings of Balthazard and Nicloux and of Bollet. While in normal persons the coefficient of intoxication is very constant, it is noticeably lowered in the person with a co-existing defect, such as chronic nephritis or hepatic cirrhosis. Other similar visceral alterations can assuredly lower resistance. Regarding their own case, they conclude that the patient's point of weakness lay in the nervous system itself. In the war he had had cerebrospinal meningitis and twice had suffered concussion with loss of consciousness. Such antecedent occurrences are enough to create a special vulnerability to the gas in spite of the small amount inhaled.

"It is suggested that chemical examination of the spinal fluid offers a means of diagnosis in uncertain cases." — K. R. Drinker.

The Action of Benzol. VI. Benzol Vapor Leucopenia (Rabbit). *H. G. Weiskotten, C. B. F. Gibbs, E. O. Boggs* and *E. R. Templeton.* Jour. Med. Research, May, 1920, 41, No. 4, 425–438. — The author concludes as follows:

"1. Exposure of rabbits to benzol vapor with maximal sublethal dosage causes leucopenia, hemorrhages and slight anemia.

"2. The percentage and absolute decrease of small mononuclears is greater than that of polynuclear amphophiles.

"3. Apparently, after discontinuance of exposure, the total leucocyte curve rises to a permanent general level, lower than that existing before exposure. This relative leucopenia is permanent. It is due to a failure of the absolute small mononuclear curve to rise to as high a level as that existing before exposure.

"4. The results of exposure are of the same general nature as those produced by subcutaneous injections of olive oil-benzol mixture. Diphasic leucopenia was not observed." — W. B. Cannon.

Note on the Connection between Herpes Zoster and Arsenic. *Karl Mezei.* Münch. med. Wchnschr., July 16, 1920, 67, No. 29, 844–845. — In December, 1919, a young pa-

tient came to this observer with a typical lumbo-inguinal herpes zoster. She said that she had been taking arsenic for some time on account of anemia. Five months later she returned with a herpes zoster following the distribution of the left radial nerve, a very unusual situation. There were three groups of typical vesicles on an erythematous base, separated by intact skin. The patient said these came out after the twentieth injection of arsenic. A few days before there had been slight itching and formication. Twenty-four hours after the red spots came the vesicles filled with clear serum. An interesting feature of the case was that no pain worth mentioning occurred at either attack. — H. G. Noyes.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

Industrial Epidemiology. *W. A. Sawyer.* Jour. Am. Med. Assn., Oct. 16, 1920, 75, No. 16, 1041–1043. — The author discusses the control of the following epidemic diseases from the point of view of the industrial physician.

Smallpox. — Vaccination is required of all new employees, about 50 per cent. of "takes" being secured.

Typhoid. — It is suggested that typhoid vaccine might be administered upon Saturday with return to work on Monday and without loss of time.

Diphtheria. — Throat cultures should be taken in all suspicious cases and the possibility of offering a Schick test to employees considered.

Tuberculosis. — Entrance physical examinations are important and particular attention should be paid to a history of loss of appetite, loss of weight, and general weakness. These symptoms, together with any temperature, should cause very close supervision. The author is apparently convinced that most industries which report but little tuberculosis are not finding and caring for their early cases.

Respiratory Diseases. — The following plan is advocated:

"1. Instruction for all those in a directing or supervising capacity, in recognizing a cold in its incipience, with orders to send to the physician everyone who falls within this group.

"2. Authority to the physician to send home employees who appear ill or have a temperature of 100 or over, and who are sneezing and coughing, or have a profuse discharge from the nose.

"3. Follow up to see that those persons who are sent home receive proper treatment. This should be done by a visiting nurse. This means helping the local health department, in that certain other diseases may be detected in their early stages.

"4. Careful inspection by the physician on their return of all who have been sent home.

"5. Charting of records of sickness incidence by departments so that attention may be quickly turned to those departments showing an increased amount of illness.

"6. Education for all as to methods of prevention, which may be done through plant publications, bulletins, leaflets or lectures.

"7. Proper ventilation, cleanliness of surroundings, prevention of fatigue, and last but not least the avoidance of overcrowding. One has only to visit some of our industries late in the day when all the freshness and sweetness of the air has been vitiated to appreciate how far in the dark ages we are living."

Venereal Diseases. — Education of the employees and helpfulness toward those affected are most important.

The author estimates that in his plant ten and one-half days a year are lost on account of sickness and believes that proper epidemiological supervision can do much to reduce the enormous economic loss so experienced. — C. K. Drinker.

Anthrax as an Occupational Disease. *J. B. Andrews.* U. S. Bur. Labor Statis., Bull. 267, July, 1920, pp. 186. — This is a revision of Bulletin 205 of the Bureau of Labor Statistics.

This very complete bulletin begins with an historical discussion of anthrax and then passes on to a description of the medical aspects of human infection. The industries affected are next considered and both the United States and continental experience are carefully recorded. A whole chapter is devoted to a discussion of the present status of the problem of disinfection and the last chapter to a complete survey of the recommendation for the control and prevention of anthrax. In Appendix A, the United States

rules and regulations pertaining to anthrax are completely described while in Appendix B are quoted in a similar manner the continental regulations. There are ten full-page pictures and one colored page showing anthrax bacilli and three stages of the human skin infection.

From both the public health and industrial point of view this book is a complete study of anthrax. — Leonard Greenburg.

A Reliable Disinfectant Bath for Soda-Water Glasses and Other Drinking and Eating Utensils. *L. E. Sayre* and *F. A. Patty*. Abstracted as follows from Kansas State Board of Health, Bull. 16, 1920, pp. 76–80, by F. L. Mickle in Chem. Abstr., Aug. 20, 1920, 14, No. 16, 2524. — "A laboratory investigation was undertaken to determine whether NaClO solution would serve as an efficient disinfectant bath for washed soda-water glasses. Of 19 solutions of various compositions only those containing available Cl were suitable for a disinfectant bath. Free Cl was not the only factor determining efficiency for 0.04 per cent. was as efficient as 0.1 per cent. available Cl. The degree of alkalinity was found important. The most satisfactory solution was one with 0.05 per cent. available Cl and almost neutral. This bath is harmless to the hands. The formula for the disinfectant bath is given in apothecaries' and metric systems. Twenty-four hour broth cultures of Micrococcus aureus, B. typhosus, and Streptococcus pyogenes were poured into previously sterilized glasses. The glasses were drained, dipped into the disinfectant bath and removed immediately, rinsed with sterile broth and a portion of the broth streaked on agar and incubated. This was an effort to duplicate practical working conditions where the time element would be reduced to a minimum and the usual disinfectants rendered useless. It is recommended that the bath be prepared fresh daily, even though experiments showed it to be germicidal for periods longer than twenty-four hours. Hot water was found not at all efficient. At the fountain, glasses must not be permitted to become entirely dry, but should preferably be washed, then rinsed in tap water and placed in the disinfectant. Rinsing increases efficiency because introduced dish-water raises the alkalinity of the bath." — W. O. Fenn.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

Early Surgical Treatment of Burns of the Conjunctiva. *R. Denig*. Am. Jour. Ophth., April, 1920, 3, No. 4, 256–258. — "In the case here reported the tissue burned by chlorinated lime was immediately removed, and mucous membrane from the lip used to replace it. Speedy healing and excellent result followed. This plan is advocated for cases in which there is danger of infiltration of the cornea." — K. R. Drinker.

The Removal of Steel from the Eye from an Industrial Standpoint. *C. A. Clapp*. Abstracted as follows from Am. Jour. Ophth., May, 1920, 3, No. 5, 325, by W. F. Moncreiff in Internat. Abstr. Surg., Sept., 1920, 31, No. 3, 238. — "The author reports a series of 29 cases in 10 (35 per cent.) of which useful vision was obtained after magnet extraction of the foreign body. In 11 cases (38 per cent.) the eye was lost, in 7 (24 per cent.) light perception to motion was retained, and in 4 cases normal vision resulted. Of the 7 patients operated on by the posterior route 5 retained useful vision. In 16 cases the injury occurred in the right eye, and in 12 in the left. The average size of the foreign body was 3.8 by 2 by 1 mm.; the largest was 20 by 5 by 4 mm.; the smallest, 1 by 0.5 by 0.5 mm.

"The author states that until a few years ago his experience had led him to favor the anterior method of extraction but he now prefers the posterior route. It must be borne in mind, however, that each case should be handled according to its particular requirements." — K. R. Drinker.

Some of the Complications Following Foreign Bodies in the Eye. *W. C. Smith*. Abstracted as follows from Internat. Jour. Surg., 1920, 33, p. 59, by T. D. Allen in Internat. Abstr. Surg., June, 1920, 30, No. 6, 483. — "Smith reviews the subject of foreign bodies in the eye, noting especially the most common positions of such bodies and the nature of the complications to which they give rise. He speaks of the necessity for care in the removal of bodies from the center of the cornea in order that undue injury and diminished vision may be avoided. He calls attention to the fact that certain metals enter into chemical combination with the fluids of the eye. The soluble metallic

salt is often extremely irritating and great care should be taken to remove every particle of it.

"Corneal abrasions, although most painful, are often very difficult to see. As an aid in the diagnosis a 2 per cent. fluorescin sodium bicarbonate solution should be used to stain such an area. For the treatment of corneal ulcer Smith recommends aseptic cleansing and a tight bandage. In cases of infection, heat (about 150 degrees F.) is beneficial and not injurious to the corneal tissue.

"All patients with foreign bodies in the eyeball should be sent to an ophthalmic surgeon but if the foreign bodies are of steel and can be localized, an attempt may be made first to extract them with a giant magnet." — K. R. Drinker.

Ocular Lesions Caused by Asphyxiating Gases. *M. Danis.* Am. Jour. Ophth., May, 1920, 3, No. 5, 323–324. — This is a translation by Dr. M. W. Frederick of a paper by Dr. Danis summarizing the results of his observations in the Belgian army of the effects on the eye of various gases used in gas warfare.

Two kinds of gas act principally upon the ocular apparatus: the tear producing and the blistering gases. Of the tear producing gases the most common are: chlorine, bromine, methyl monochloride chloroform, methyl bichloride chloroform, acrolein, acetone bromoform, methyl acetone bromoform, benzyl bromate, benzyl iodide, phenyldichlorarsine, and diphenylchlorarsine.

The symptoms produced by these gases are a sensation first of itching or even of burning, tearing, intense blepharospasm and photophobia, hyperemic bulbar and palpebral conjunctivae, but no ciliary injection or corneal lesions. The symptoms appear immediately after gassing and disappear with no traces in a few days.

The most common blistering gas is mustard gas or dichlorethylsulphide. The lesions caused by this gas consist of conjunctival and ciliary injection preceding violent blepharospasm and photophobia. The hyperemia is in the beginning localized to the parts exposed through the lid aperture. The corneal epithelium may show a slight lesion, or a deep and extensive ulcer may be present. Contraction of the pupil and burns of the eyelid may occur. The prognosis in general is good. — K. R. Drinker.

Alterations in Twilight Vision in Occupational Nystagmus. *L. Weekers.* Am. Jour. Ophth., March, 1920, 3, No. 3, 162–166. — The author emphasizes the importance of general over-fatigue plus a local sensorial fatigue as the cause of the alterations in twilight vision accompanying miners' nystagmus, and instances the frequent hemeralopia of soldiers as comparable to the hemeralopia so pronounced in miners' nystagmus. In the coal miner who does all his work in a poor light, the foveal vision, which would under normal conditions regulate the movements of the eyes, is lacking. Hence there results a sort of visual groping, from the inco-ordination of the movements and also from the visual fatigue.

"On the other hand, binocular vision also must be maintained under abnormal conditions. The broken coal has an angular and crystalline surface. The lamp, lighting some of the facets, is reflected. Each eye sees different facets destroying binocular vision, and fatiguing the eyes."

Insufficient light, the necessity for looking upward, the sudden and frequent passing from light to darkness in going down into and coming up from the mine are all causes of visual fatigue. — K. R. Drinker.

Loss of Industrial Vision. *Walter N. Sharp.* Am. Jour. Ophth., June, 1920, 3, No. 6, 434–435. — The author gives the following table for calculating loss of industrial vision:

"20/200 = 10% vision or 90% loss
20/150 = 35% " " 65% loss
20/100 = 60% " " 40% loss
20/80 = 70% " " 30% loss
20/70 = 75% " " 25% loss
20/60 = 80% " " 20% loss
20/50 = 85% " " 15% loss
20/40 = 90% " " 10% loss
20/30 = 95% " " 5% loss
20/20 = 100% " " no loss."

— K. R. Drinker.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

Proceedings of the Sixth Annual Meeting of the International Association of Industrial Accident Boards and Commissions, Toronto, Canada, September 23–26, 1919. U. S. Bur. Labor Statis., Bull. No. 273, Aug., 1920, pp. 424. — The following is a list of the papers delivered at the 1919 meeting of the International Association of Accident Boards

and Commissions. Minimum requirements in compensation legislation, by Royal Meeker; Some comparisons of workmen's compensation legislation, by F. H. Bohlen; Is a uniform compensation act possible or desirable, by Charles S. Andrus; Lump-sum settlements, by A. B. Funk; Compensation law administration, by Jeremiah F. Connor; Handicaps of competitive state funds, by F. Spencer Baldwin; Replacing the injured man in industry, by William W. Kennard; The larger idea in workmen's compensation, by Will J. French; Problems of medical treatment under the Minnesota act, by John P. Gardiner; Employees engaged in interstate and foreign commerce, by Lindley D. Clark; Attitude of railroad transportation organizations toward federal compensation, by D. L. Cease; Defects in workmen's compensation laws, by John Mitchell; Disabilities as aggravated by pre-existing conditions, by John W. Mowell; Infections of the upper extremities, by P. A. Bendixen; Cancer, with special reference to sarcoma in its relationship to trauma, by Raphael Lewy; Eye injuries, by Frank C. Trebilcock; The need of recognition of better treatment for mental and nervous injuries, by F. D. Donoghue; The securing of proper medical service for injured persons, by J. W. Trask; How can medical service be improved, by Otto P. Geier; How can medical service be improved, by Morton R. Gibbons; How can medical service be improved, by F. H. Thompson; Fractures, by N. A. Powell; Some features of workmen's compensation law and its administration, by Samuel Price; Comparative insurance rates under different systems, by E. E. Watson; Tests of efficiency in workmen's compensation administration, by Carl Hookstadt; Principle and practice of co-operation in industrial relations as embodied in plans of employee representation, by A. H. Young; Study of accident experience, by L. W. Hatch; and Proposed method of comparing workmen's compensation costs under various laws, by T. N. Dean.

The discussion which accompanied these papers is also included in the bulletin under review. — K. R. Drinker.

Our Safety Week in the Border Cities and its Successes. *Jack Robins.* Pub. Health Jour., Aug., 1920, 11, No. 8. 356-358. — The author of this paper which was read at the 1920 Annual Meeting of the Ontario Safety League is the paid secretary of the Border Cities' Safety Council, Windsor. After describing the special efforts during the Safety Week the author gives an account of some of the routine activities of the council. Among these is the establishment of a school of safety instruction which meets twice a month and issues diplomas to regular attendants. This year there will be an additional school for those who hold the diplomas and also a school for truck drivers and automobilists. Safety will, at the same time, be taken up as part of the regular school work for children. It is firmly believed that the best and quickest way to educate the people in safety is to organise local safety councils in each community. — R. M. Hutton.

Accident Prevention in the Pulp and Paper Industry. *A. P. Costigane.* Pub. Health Jour., July, 1920, 11, No. 7, 307–315. — This paper, which was read at the 1920 annual meeting of the Ontario Safety League by Mr. Costigane, secretary and engineer of the Ontario Pulp and Paper Makers' Safety Association, deals with methods of reducing accidents produced by causes other than unguarded machinery. These are estimated at from 75 to 80 per cent. of the total accidents, and reduction can only be obtained with the co-operation of the employees. After reviewing the points to be gained by an educational campaign — briefly, reduction in accidents, lost time and labor turnover, and the establishment of good feeling between employer and employee — Mr. Costigane makes numerous suggestions as to means of stimulating interest. The following may be instanced:

1. *Means of stimulating interest among employees.* — (a) Safeguarding physical hazards; (b) teaching English to foreigners; (c) issuing books containing safety instructions; (d) placing bulletin boards in each department on which should be posted regularly bulletins depicting the causes and results of accidents; (e) exhibiting safety films and giving short safety lectures; (f) arranging matinees for schoolchildren to see safety films, and encouraging essay competitions; (g) designing and distributing safety calendars; (h) encouraging attendance at night schools; (i) formation of safety committees.

2. *Means of stimulating interest among employers.* — (a) Comparative monthly statistics showing the position of each mill in comparison with other mills in the province; (b) chart issued annually classifying all accidents during

the year; (c) letters commenting on accidents which might have been avoided.

It is interesting to note that a fund started by the Canadian Pulp and Paper Association for the compilation of textbooks on the industry was supported by all the mills in the association and that a fund of $30,000 has been raised from mills in Canada and the U. S. A. It is also interesting to find definitely formulated in this paper the view of the Canadian Pulp and Paper Association that education makes for efficiency and efficiency for reduction of accidents. — R. M. Hutton.

THE EMPLOYMENT AND PRESERVATION OF EXPLOSIVES. *Junghans.* Zentralbl. f. Gewerbehyg., May, 1920, 8, No. 5, 86–90. — This article is a continuation and conclusion of a study of the necessary precautions in the use of explosives, evidently with especial reference to blasting. The author sums up his advice in a long list of "don'ts," most of them somewhat obvious and presumably generally practiced. They include such precautions as the following: to avoid examining too soon loads that have failed to discharge; to avoid careless handling of explosive caps; to avoid carelessness in the use of electrical firing apparatus, such as using defective wires, making loose connections, using electrical apparatus during a thunder storm, and the like. There are cautions about the proper handling of dynamite, about the exposure of explosives to high or to low temperatures, to dampness, about using frozen or chilled dynamite, and in respect to following carefully the directions given by the dealer in regard to warming. — G. E. Partridge.

CIRCULAR SAWS AND ACCIDENT PREVENTION. *A. Preuss.* Zentralbl. f. Gewerbehyg., June, 1920, 8, No. 6, 97–101. — The war has destroyed the fine sense of precaution which formerly existed in the industrial life, but it must be cultivated once more. Industrial accidents are a serious menace, and they are destructive of valuable man power which cannot well be spared. The present requirements in the matter of protection against accidents in the use of machine saws demand that saw-hoods and wedges shall be provided, properly placed with reference to the cutting surfaces, etc. The upper edge of the saw is to be covered so far as the nature of the work will allow, and the blocks are to be regulated with regard to distance from the saw teeth. These requirements leave much to be desired, due to the conditions that arise from the use of several sizes of saws on the same equipment and the necessity for frequent changes in adjustment, etc. The writer shows by diagram an automatic device for remedying these difficulties — a device first described in a report of the activities of the Technical Superintendence Board of the Thuringian Builders' Trade Co-operative Association, made in 1913. This device is described as a self-acting protecting hood. It consists of a heavy hood with a curved under surface, fixed at one end back of the saw, and balanced at the front end by a weight and pulley. This hood is evidently raised and lowered by the advancement or withdrawal of the materials in use, exposing the surface of the saw as required, and at the same time serving as a block to the materials and a protection for the hand. The device can best be understood by referring to the diagram. — G. E. Partridge.

INDUSTRIAL SURGERY

SOME PRACTICAL POINTS IN MINOR INDUSTRIAL SURGERY. *Wickes Washburn.* Am. Jour. Surgery, April, 1920, 34, No. 4, 108–109. — The author discusses the treatment of mashed fingers, of wounds by barbed wire, and of wounds where fracture is suspected, and cites cases illustrating the results of his treatment. Early, persistent, and thorough manipulation of joints is stressed. — K. R. Drinker.

THE PARAFFIN TREATMENT OF BURNS. *A. J. Hull.* Abstracted as follows from Jour. Roy. Army Med. Corps, 1920, 34, p. 151, by I. W. Bach in Internat. Abstr. Surg., June, 1920, 30, No. 6, 461. — "The burn is first washed with normal saline (or a 1:1,000 solution of flavine or proflavine) and then dried with gauze or an electric dryer. A layer of paraffin is then applied at a temperature between 55 and 60 degrees C. Over the paraffin is spread a thin layer of wool, and over the wool a second layer of paraffin. Then another layer of wool and a bandage are applied. This dressing is changed every twenty-four hours. It is important to apply the paraffin in sufficiently thick layers and at the correct temperature.

"By the method described the epithelium is conserved from damage and the tissues are held at rest. It was found that paraffin to which antiseptics were added gave better results than paraffin not containing antiseptics. Experiments to improve the base demonstrated that No. 7 paraffin is the best. The first antiseptic combined with the paraffin was eucalyptus oil used with beta-naphthol. Later flavine was employed and gave very satisfactory results. Paraffin preparations of brilliant green and chloramine-T were not satisfactory from a pharmaceutical standpoint.

"In other experiments it was found that excellent results were obtained when the antiseptic was painted on the wound before the application of the paraffin. Accordingly, with the exception of flavine paraffin and scarlet-red, the special paraffin preparations have been discarded.

"In studies of the effects of the various antiseptics it was found that eusol accelerated the cleaning of the burn but was too irritating in its action. Brilliant green cleaned the wound well but if used beyond a certain stage caused the formation of light-colored and unhealthy granulations. Flavine cleaned the surface well and produced a healthy type of granulation. Scarlet-red should be used only when the burn is clean and requires stimulation. The aqueous solution should be painted over the wound before the application of the paraffin. Both a 1 per cent. and a 10 per cent. solution have been tried but in most cases the former was sufficient. The treatment giving the best results and obviating pain, sepsis, and other complications is preliminary painting of the wound with a 1:1,000 aqueous solution of flavine followed by the application of No. 7 paraffin. In burns of long duration a 1 per cent. solution of scarlet-red should be substituted for the flavine." — K. R. Drinker.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

Diets of Laboring Classes during the War. *Margaret Ferguson.* Abstracted as follows from Jour. Hyg., 1920, 18, pp. 409–416, by W. D. H. in Physiol. Abstr., May, 1920, 5, No. 2, 90. — "A useful summary of the authoress's statistical summary of the same families during different periods (pre-war, voluntary rationing, compulsory rationing, etc.). Shortage of some articles was made up for by greater use of others, especially flour. Income was a more potent factor than legislative restrictions. Interruption of growth followed insufficient food." — McKeen Cattell.

Zinc and Copper, Regular Constituents of the Human Body. *E. Rost.* Abstracted from Die Umschau, 1920, 24, 201–202, by J. S. Hepburn in Chem. Abstr., July 10, 1920, 14, No. 13, 2034. — "If brass foundry workers be excluded from the plant, they continue to excrete determinable amounts of Zn and Cu in the feces. Many healthy persons, who have not worked in such foundries, and who have not used Zn-containing medicines or cosmetics, regularly excrete Zn and Cu in the feces and the urine. The average daily excretion was found to be 0.6 to 1.6 mg. ZnO in the urine, and 9 mg. ZnO in the feces, although it has been as high as 39 mg. in the latter. Cu was excreted in considerably smaller amounts. While some foods, such as milk and jams from sour fruits, may obtain their Zn and Cu from the metallic containers or vessels used in cooking, these two metals also occur in other foods which are not subject to such sources of contamination; thus the Zn content (mg. Zn per kg. of sample) was: meat (beef, veal, pork, mutton, horse) 26 to 50, beef liver as high as 83, horse liver as high as 339, sea fish 4, hen eggs 9.8 (*i. e.*, 0.5 mg. per egg), bread 5 to 8, potatoes 2.3, dried vegetables 6.13. Cu occurred in the meat and the liver in smaller amount; one beef liver, however, contained 119 mg. Cu per kg. of organ. The Zn present in foods is derived directly or indirectly from the soil, or from water which has flowed through galvanized iron pipes. In man, the Zn content (mg. Zn per kg. of organ) was: liver 52 to 146, musculature 47 to 52, brain 11; the Cu content of these organs was less. The blood of cattle contained Zn; and the amount of that element, in mg. per liter, present in milk was: cow 3.9, goat 2.3, human 1.3. The traces of Zn are absorbed from the gastro-intestinal tract, stored in the muscles and the liver, pass into the body fluids, and thence into the urine, the feces, and the milk. Zn has not been found in Swiss

cheese, beet sugar, or beer. Under present conditions Zn and Cu are regular, though accidental, constituents of the human, animal, and plant organism; the quantity in the food is unavoidable, and injures neither the digestive apparatus nor any other part of the body. However, neither Zn vessels nor those coated with Zn should be used in cooking or storing foods which are acid or likely to become acid; otherwise Zn salts may be formed and ingested in sufficient amount to irritate the mucosa of the stomach and intestines, and to produce other ill effects." — W. O. Fenn.

THE BLOOD IN FATIGUE. *Otto Burkard.* Il Lavoro, July 31, 1920, 12, No. 3, 80–82. — An abstract of a paper prepared for the International Congress of Industrial Hygiene which was to have been held in Vienna, August, 1914. According to the investigations of Grawitz, Rosenthal and Wagner, fatiguing work results in a true leukocytosis. During the early stages of labor, there is an increase of leukocytes which remains stationary until fatigue begins; then there is a diminution, and after rest the number becomes normal again. The increase during the first period is at the expense of the lymphocytes, but these then diminish giving place to the neutrophils, the muscles during work producing substances which pass into the blood and provoke a reaction in the bone marrow. Grawitz holds that this myogenous leukocytosis is necessary for the removal from the organism of the toxic products of fatigue. Burkard believes that the continual daily stimulation of the hematopoietic tissues may end in injury to these tissues and to the whole body. He calls attention to the fact that the only neutrophil cells found in normal blood are the mature forms — the polynuclear — and that the presence of mononuclear neutrophils cannot be physiological, but is a proof that the stimulus to blood formation has passed the normal point. He examined ten young workmen in a glass factory who were transporting glass to chilling rooms for the nine hours of their working day. He made his blood smears at the beginning of work, after three hours, and after nine hours, and noted in certain cases an increase of neutrophils, especially of pathological forms, the increase being in proportion to the work done. He thinks that this blood picture may be used to detect fatigue, which has passed physiological bounds, before it has given rise to symptoms of ill health. — A. Hamilton.

INFLUENCE OF SIX-HOUR DAY ON EFFICIENCY AND FATIGUE. *H. M. Vernon.* FATIGUE AND VILLAGE MEETING-HALLS. *C. Smith-Rossie.* MEASUREMENT BY CO_2 OF ENERGY OUTPUT. *A. D. Waller.* Abstracted as follows from Brit. Assn. Rep., 1919, pp. 308–313, by W. D. H. in Physiol. Abstr., Aug., 1920, 5, No. 5, 213. — "A series of papers related to an important practical use of physiological data." — McKeen Cattell.

THE PHYSIOLOGICAL COST OF MUSCULAR WORK MEASURED BY THE DISCHARGE OF CO_2. I. THE ENERGY OUTPUT OF DOCK LABORERS DURING "HEAVY WORK." *A. D. Waller.* Abstracted as follows from Proc. Roy. Soc., 1920, 91B, pp. 166–185, by D. H. de S. in Physiol. Abstr., June, 1920, 5, No. 3, 136. — A preliminary communication on the subject of this paper has already been noticed (JOUR. INDUST. HYG., Vol. 1, p. 41). — "The author finds that the hourly cost of piece-work is 175 calories per hour per square metre, that of time-work 100. A healthy young man, fit for military service, can do at least 100,000 kg.-metres per day, and a mechanical task of 200,000 per day is beyond his power. A table is given comparing the results with those of other workers." — McKeen Cattell.

THE PHYSIOLOGICAL COST OF MUSCULAR WORK. *A. D. Waller.* Abstracted as follows from Brit. Med. Jour., 1920, 1, pp. 537–538, by D. H. de S. in Physiol. Abstr., June, 1920, 5, No. 3, 136. — "The average rate of energy output (gross) of four compositors for one week was 101 to 105 calories per hour." — McKeen Cattell.

PHYSIOLOGICAL COST OF MUSCULAR WORK. II. COLD STORAGE LABORERS. *A. D. Waller* and *G. de Decker.* Abstracted as follows from Proc. Roy. Soc., 1920, 91B, pp. 229–248, by W. D. H. in Physiol. Abstr., Aug., 1920, 5, No. 5, 242. — "The paper presents full details of numerous observations on the cost of work as measured by CO_2 output. The general results on this class of laborers bear out the author's thesis maintained in several previous publications." — McKeen Cattell.

ENERGY EXPENDITURE IN MINOR DUTIES. *E. P. Cathcart* and *F. J. Trafford.* Abstracted as follows from Proc. Physiol. Soc., 1920, Jour. Physiol., 53, p. xcix, by W. D. H. in Physiol.

Abstr., July, 1920, 5, No. 4, 188. — "Data are given for the expenditure in brushing boots, washing hands, window cleaning, and scrubbing floors. The calories expended per square metre per minute average 1.4, 1.5, 1.8, and 2.1 respectively." — McKeen Cattell.

Physiological Cost of Printer's Work. *A. D. Waller* and *G. de Decker*. Abstracted as follows from Proc. Physiol. Soc., 1920, Jour. Physiol., 1920, 53, pp. civ–cvii, by W. D. H. in Physiol. Abstr., July, 1920, 5, No. 4, 188. — "Work on the lines of previous work. The heavier the labor, the greater is the output of CO_2. Cerebral work (proof-reading) has no appreciable effect." — McKeen Cattell.

Metrotherapy, or the Measure of Voluntary Movement: Its Value in Surgical Reconstruction. *Fred H. Albee* and *A. R. Gilliland*. Jour. Am. Med. Assn., Oct. 9, 1920, 75, No. 15, 983–986. — The authors describe various forms of apparatus for use in cases where movement of a part is restricted as a result of injury, which permit accurate measurement of improvement. The term "metrotherapy" is given to such measurements since it has been found that the psychic stimulation which a patient obtains from steadily observing and recording improvement really makes the simple matter of measuring a valuable therapeutic adjunct.

The apparatus used and the case reports given must be followed in the original article in order to be appreciated. — C. K. Drinker.

Observations on the Physical Efficiency Tests Used by the Royal Air Force of England. *E. C. Schneider*. Abstracted as follows from Proc. Am. Physiol. Soc., 1919; Am. Jour. Physiol., 51, pp. 179–180, by G. D. C. in Physiol. Abstr., June, 1920, 5, No. 3, 114. — "An analysis of the records of American aviators who underwent the physical efficiency tests of the R. A. F. in England led to the conclusion that the tests were not a trustworthy indication of the capacity of a man to respond to low oxygen tensions. The tests depended too much on the hearty co-operation and the complete attention of the subject." — McKeen Cattell.

Effect of Breathing Dry and Moist Air. *E. P. Lyon* and *E. Greisheimer*. Abstracted as follows from Proc. Am. Physiol. Soc., 1919; Am. Jour. Physiol., 51, p. 191, by G. D. C. in Physiol. Abstr., June, 1920, 5, No. 3, 132. — "Tentative results of breathing air at 20–30° C., with humidity 10 and 90 per cent. respectively (temperature of room being 20–22° C. and humidity 50–60 per cent.), were higher pulse rate, lower respiration rate, higher arterial pressure, greater peripheral vascularity in breathing moist than dry air." — McKeen Cattell.

Artificial Respiration with and without the Addition of High Concentrations of Oxygen. *Wauer*. Zentralbl. f. Gewerbehyg., Aug., 1920, 8, No. 8, 159–165. — The author abstracts and comments upon a published military report on the subject by A. Loewy and G. Meyer. The Sylvester method for artificial respiration is shown to give greater lung ventilation per minute than the Howard method, and is said to have no greater difficulty in the hands of inexperienced operators than the Howard. A tongue halter is recommended for either method, the desirability of turning of the head sharply to one side to maintain a passage through the pharynx not being considered sufficiently demonstrated. Wauer thinks this latter method should be taught.

The apparatus used in the army was hardly ample to supply oxygen for continuous use in the Sylvester method. It was found feasible to combine artificial respiration with the use of oxygen. Unless the war gas mask was used, no tongue halter could be used. Concentrations of oxygen varied, but due to loose masks and design of apparatus it never reached 100 per cent. oxygen, which they confirmed by animal experiments as being toxic if continued. There was no ozone in the oxygen.

The use of oxygen in carbon monoxide poisoning hastens recovery by raising the concentration of oxygen in the blood and facilitating the separation of carbon monoxide from hemoglobin.

Different types of apparatus are described and criticized. The Sylvester method with simple mechanical aids is sufficient except in carbon monoxide poisoning where they recommend the addition of oxygen from a bomb. — E. L. Sevringhaus.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

Mishaps from Electricity; Rescue Work. *M. D'Halluin.* Journal de Radiologie et d' Electrologie, June, 1920, 4, No. 6, 254. Abstracted as follows in Jour. Am. Med. Assn., Nov. 6, 1920, 75, No. 19, 1297. — "D'Halluin's research on dogs has confirmed the importance of fibrillation as a most serious effect of exposure to an electric overcharge. The respiratory phenomena should be combatted by the classic measures, but the phenomena on the part of the heart, primary or secondary, call for immediate application of massage to the heart, although not with much hope of arresting the fibrillation by this means alone. But we have in intravenous injections of potassium chlorid, he continues, a simple means to combat this irregularity of the heart, applied in connection with massage. This drug is a poison for the heart muscle, but it becomes diluted in the blood stream. The fatal dose is 14 cg. per kg., if injected rapidly, but up to 33 cg. can be borne injected slowly. His practice in dogs is to inject a 5 per cent. solution into the jugular vein, in the dose of 4 c.c. per kilogram of weight. Instantaneously the fibrillation ceases. Continuing the massage of the heart for five minutes, ten mintues, or even longer, the heart begins to contract again. He asks 'Why not apply to man this treatment which has proved so effectual on dogs?' Before he had learned of this efficacy of potassium chlorid he lost 63 per cent. of the dogs after inducing the fibrillation, the massage alone not being enough to resuscitate them, but after injection of the drug, he saved 65 per cent. even when the massage was not begun until ten or fifteen minutes after the arrest of the heart. He remarks that the desired effect would probably be realized with a proportionally much smaller amount than 4 c.c. per kg. This drug seems to combine the greatest potency with the least harmful action of the large number of measures he tested." — M. C. Shorley.

WOMEN AND CHILDREN IN INDUSTRY

Further Suggestions for the Preparation and Placing of Women as Industrial Inspectors. *Hertha Bernecker.* Comment by *Matthes.* Zentralbl. f. Gewerbehyg., Sept., 1920, 8, No. 9, 176–179. — Fräulein Bernecker is convinced that woman by reason of her sex is particularly adapted for the industrial protection of women and children, and consequently suggests the possibility of separating this part from the general field of industrial inspection. To this new department the author would give authority for co-operative inspection in all industries employing women, children or homeworkers, and consideration of all cases which might arise from these classes of workers. Liaison between employer and employee would be no small part of the work of these new women inspectors.

Although perhaps at first forced to occupy the same quarters as the existent inspectors, complete independence of judgment and of action will be the only way of attracting truly competent women, scientifically and practically trained. Auxiliary inspectors may be drawn from among the working women themselves in the crowded industrial centers.

As "conscientious" preparation for such a career, Fräulein Bernecker advocates the completion with examination of four semesters of university work, with compulsory economics and jurisprudence, at a higher institution of learning. This is to be followed by a year's practice in factory work as toiler and forewoman. After another year spent in a woman's social training school recognized by the government, twelve months' employment as industrial inspector would complete the education. Final placement would follow the passing of a rigid government examination for women industrial inspectors.

Five years is set as the period of transition.

Matthes considers Fräulein Bernecker's plan too extensive. Not only do the present financial difficulties of the government argue against this change, but the question of the place of academically trained women in such positions seems to be still unsettled. Aid for working women and girls belongs more in the sphere of activities of the factory nurse and charity establishment. Besides, the separation of male and female industrial inspection would give rise to

so many conflicts that it should not even be considered. — H. V. Williams.

THE WORK OF WOMEN ON TRAMWAYS. *A. Ranelletti* and *Fraschetti*. Abstracted from Bollettino dell' Ufficio Municipale del Lavoro, 1919 in Il Lavoro, July 31, 1920, 12, No. 3, 82–83. — The authors examined 380 women — 49 of them motormen, and 331 conductors — who had been employed on the tramways for at least six months. Most of them were between 22 and 40 years of age and had previously done only domestic work. The effects of the work seemed to be an increase of menstrual disturbances — excessive flow and severe pain — anemia, and pharyngolaryngitis. The authors think that the cause of these complaints is to be found in the prolonged standing which sometimes lasted twelve or thirteen hours, night work, exposure to cold, and unhealthful conditions in the tram-cars. The majority of women were not able to do work of this sort without injury to their health. — A. Hamilton.

NEED OF PROTECTING THE HEALTH OF WORKING CHILDREN. *Harold H. Mitchell.* Mod. Med., July, 1920, 2, No. 7, 517. — It is estimated that about three-quarters of a million children in the United States between the ages of 14 and 15 years go to work. Most of them engage in occupations dependent upon their manual capacity. This means that good health is the greatest single factor in their remaining satisfactorily employed. It also means that the greatest possible demands are made upon their physical resources. They are more liable to injuries from the various industrial hazards than adults. The child labor health problem demands careful medical examination before employment so that only the physically fit shall be allowed to enter industry. Such examinations should result in the correction of all possible physical defects. When necessary subsequent examinations should be made and children permitted to remain employed only when their physical condition is satisfactory. Another important step in the preservation of the health of the working minor should be adequate instruction in health matters. — C. H. Paull.

INDUSTRIAL CHILD LABOR DURING THE WAR. *W. Rohde.* Concordia, Jan. 1, 1920, 27, No. 1, 2–3. — The Prussian industrial reports show that with a decreasing demand in some lines of legal employment for children and an increasing demand for labor in manufacturing there has been much illegal employment of children. This was made easier by poor school registration and overburdened officials who took a more lenient attitude toward violations of the laws. Other war conditions and excuses are offered. The revolution of November, 1918, with all its unemployment has brought the status of child labor largely to the pre-war condition. — E. L. Sevringhaus.

THE INDUSTRIAL EMPLOYMENT OF YOUNG LABORERS AND CHILDREN IN 1914–18. Concordia, Feb. 15, 1920, 27, No. 4, 37–41. Published reports of the government industrial officials show that, during 1914–18, in the different parts of Germany the employment of young labor in industry very considerably increased. Apprenticeships suffered and for a long time men were trained for skill in no more than one job. Many complaints were made of the conduct of the workers in and out of the factory. There was much night work, less overtime work, and a minimum of Sunday work. The reports show no attention paid to the problems of the health of the workers.

Children under 14 were also widely employed, the officials permitting violations of the law against child labor except in flagrant abuse of the children. Children were employed even in dangerous industries such as lead and zinc works. Return to former legal restrictions will be difficult since parents, teachers, employers and officials have yielded to economic pressure during the war. — E. L. Sevringhaus.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

RELATION OF METAL MINE VENTILATION TO SAFETY AND EFFICIENCY. *D. Harrington.* Safety Engin., Aug., 1920, 40, No. 2, 65–67.— The desirability of efficient control of air currents and the necessity of supplying metal mine workers with better and safer working conditions have created an active interest in metal mine ventilation. Whereas in coal mines ventilation is generally considered as essential, in many metal mines, especially shallow ones,

the operators pay little attention to ventilation, or ignore it altogether. There is, in fact, greater necessity for adequate ventilation of metal mines than of coal mines. The latter require air currents to remove explosive gases and the fumes of explosives, but metal mines, in addition to the need of removing fumes of explosives, and occasionally explosive gases, frequently have need of removing dusts dangerous to health, reduction of high temperatures and high humidity, and the removal of inert but unhealthful gases like carbon dioxide and nitrogen. The generally accepted superior health of coal miners as compared with metal miners is probably due in large part to the better circulation in working places of coal miners. The principal factors of metal mine ventilation as related to health and safety are the effects of ventilation on high temperature, high humidity, gases and dusts. — R. M. Thomson.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

Ideals in the Organization of an Industrial Medical Service. *Emery R. Hayhurst.* Am. Jour. Pub. Health, Sept., 1920, 10, No. 9, 715. — This brief article is a plea for the plant medical department to be managed by a committee representative of both employer and employees with at least one representative of the local board of health. Representation should be proportional with the local health representative having the deciding vote in case of a divided opinion, or in cases of importance reference to a higher state committee composed of representatives from the local or state manufacturer's association, workmen's organization, chamber of commerce and the state board of health. The cost of the industrial medical service should be divided, the industry paying for the equipment but maintenance being charged partly to employees and partly to the direct cost of production. — H. F. Smyth.

A Program for Organizing and Co-ordinating Industrial Clinics. *Bernard J. Newman.* Am. Jour. Pub. Health, Aug., 1920, 10, No. 8, 637. — The author summarizes various economic conditions of recent development which are forcing an industrial health program and developing the need for the industrial clinic. He dwells on the unreliability of much of the present information as to occupational poisons and other health hazards of trade. The properly co-ordinated industrial clinic has great value as a clearing house of information and a research center. Various ways are enumerated in which such clinics may be of value to the worker, the general practitioner, and the community, and may act as a neutral agency for physical examinations, advice, treatment, consultation, research and influence on protective legislation. References are made to clinics already established, such as that of Professor Devoto in Milan, Italy, and those in New York City, Boston, Philadelphia, and Chicago. No definite plans of organization are given as such clinics should be adapted to the environment and should be established only after a study of the industries, nationalities, and resources of the community to be served. Suggestions are made, however, as to personnel, advisory council, equipment and financing, and the value of standard forms of record keeping is insisted upon. The forms developed by the Office of Industrial Hygiene and Sanitation of the U. S. P. H. Service are recommended and the advisory services of this office are offered wherever the establishment of such a clinic is contemplated. — H. F. Smyth.

The Group Industrial Surgical Hospital. *A. Moncrieff Carr.* Mod. Med., June, 1920, 2, No. 6, 426–430. — By a group industrial hospital is meant a hospital serving a group of industries. Few single industries can afford to maintain establishments and employ the necessary skilled help. So we have a few large industries fairly well served, but many small industries are not able to secure the best surgical skill or hospital facilities. At present the great mass of injured are treated in general hospitals and no special care is given. The industrial surgical hospital should be a central hospital, with outlying dressing or emergency stations, organized for prompt, efficient emergency and surgical service for a group of industries. It should be developed with a view for the special needs of the group. A description of the personnel which such a hospital would require is herewith given, also detailed descriptions of the architectural plan for the group industrial surgical hospital, the receiving department, the

examining department, ambulance service, the surgical department, the ward for medical cases, laboratory and X-ray department, commissary department, quartermaster's department, follow-up and social service, record system, etc. — L. A. Shaw.

Plant Dispensaries and Their Equipment. *C. D. Selby.* Hosp. Management, April, 1920, 9, No. 4, 56–62; May, 1920, 9, No. 5, 56–60. — The author emphasizes the following six points which are essential to good service in plant dispensaries:

1. Plant dispensaries should be accessibly located.
2. The arrangement of the rooms should be such that those which are used most will be most accessible.
3. Equipment should be grouped in units and the units so arranged that those most used will be most accessible.
4. Personnel should be pleasant and pleasing to look at, as well as versed in knowledge and trained in technic.
5. Patients should be treated with the same consideration and conscientious attention as though they were private patients.
6. Records should concern individual cases of injury and illness, chronological histories of each workman, and show in summary form the variety and volume of cases occurring. — L. A. Shaw.

Consultant Medical Service on a Graduated Income Basis. Lancet, July 3, 1920, 199, No. 5053, 26. — Messrs. Thomas de la Rue and Company, Ltd., a London business house, have met with such success in their experiment in providing a complete medical service for their staff and workpeople that they are now commending it to other companies. In accordance with the arrangements made by this company, a number of consulting physicians and surgeons have agreed to treat privately at reduced fees patients sent to them by the company, the fees to be based upon what is described as "adjusted income." This includes private means as well as salary, one-fifth of the total being deducted on account of a wife, and a further one-tenth on account of each child or other dependent. The fees vary from 10 to 60 per cent. of the usual charge for operations and from 25 to 100 per cent. in the case of consultations and medical treatment. In order to avoid cases being sent to the consultant staff without due cause, a certificate is required in each case from the company's medical adviser, together with a voucher stating the proportion of the normal medical fee payable by the patient. A further proposal is now made with a view to providing a central nursing home for employees from a number of business houses at reduced fees. — M. C. Shorley.

A Physical Therapeutic Centre: An Experiment by the North Staffordshire Coal and Iron Masters along the Suggested Lines of Future Medical Service. *T. Lister Llewellyn.* Brit. Med. Jour., Sept. 18, 1920, 2, No. 3116, 434–436. — An account of the establishment and the results of the first year's working of a "massage centre" for the treatment of injured workmen is given. The employers of the coal and iron industries of this district found that much time was lost by the workmen during convalescence from fractures and other injuries. It was also shown that local hospitals were overcrowded and the local physicians were not able to carry out the massage and the necessary after-treatment for such cases. Hence the "massage centre" was established by the employers to provide free treatment to their employees. During the first six months 181 cases were treated and during the second six months 310 were treated, thus showing the increasing popularity of the centre. It is estimated on the basis of the present compensation rate of 35*s.* per week, that if the injured man's return to work can be expedited by one week, the centre will be a financial success. The employers are convinced that this result has been achieved and have decided to make the centre permanent. The results seem to show that both employers and employees are benefited by the establishment of this centre. — J. T. Wearn.

Medical Director at Department Meetings. *A. S. Jones.* Hosp. Management, June, 1920, 9, No. 6, 54–56. — The manner in which the dispensary work at the Shamokin plants of J. H. and C. K. Eagle, Inc., is carried on is described in this article. The equipment consists of the dispensary and treatment room with necessary surgical and medical instruments. The hazards encountered in this industry — the manufacture of silk — are not extraordinary or serious. To outline more clearly the scope, activities and methods of the medical department, it is considered under the following heads: (a) surgical treatment, preventive surgery; (b) medical treatment, preventive medicine; (c) sanitary and safety inspection;

(d) co-operation with the employment department, including welfare work, education, forms used, physical inspection of applicants for work; (e) first-aid work; and (f) extension to other plants and future development.

In certain cases an outside physician is employed. If financial aid is needed, it is quietly furnished. There is no desire, however, that the employees should become objects of public charity.

In the dispensary a daily record is kept of every patient. In the event that medical examination indicates a condition which requires attention but does not disqualify the employee for work, a clinical record card is started and a "follow-up" instituted. — L. A. Shaw.

THE MEDICAL DEPARTMENT AT E. W. BLISS COMPANY. *Donald W. Gildersleeve.* Mod. Med., Aug., 1920, 2, No. 8, 559–564. — The medical department of this company as it is administered at the present time has been in existence for six years. The department is under the control of a medical director who, in addition to his general executive duties, has charge of the clinic for injured employees and visits them at their homes when such visits are necessary. All cases requiring unusual medical service are referred to specialists. The relief work of the medical department is supplemented through the activities of an employees' association which renders financial assistance to workers.

Taking the Brooklyn plant of this company as the most adequate illustration of its medical work, the writer points out that besides the central offices there are four emergency rooms. The staff of nurses and men in charge of the emergency rooms is augmented by two clinical assistants and a secretary of the department. The employment of the secretary relieves the medical director of a large amount of routine work, such as the keeping and filing of records, handling of compensation checks, etc.

The physical examination of the employees is conducted by the medical director, the character of the examination being to some extent determined by the type of work for which the individual is hired. The examining of new employees is a comparatively new procedure. Of the first thousand physical examinations given, 96 per cent. of the individuals examined were accepted for employment. Although the return to the company from the physical examination has been wholly adequate, employees have benefited even more. Employees are carefully advised as to their condition and there is a follow-up of cases of physical defects.

Emergency rooms are provided with equipment for first-aid treatment. Those in charge of the rooms are thoroughly instructed as to whether treatments should be given there, whether patients should be sent to the hospital, or what other disposition should be made of each case. In this way much loss of time is prevented.

As an adjunct of the actual work of the various branches of the medical department a system of record forms has been developed. Reproductions of a number of these forms are given in the article. They cover notice of employment to the medical office, examination notice, physical examination record, and periodic report forms.

Among the general observations made by the writer is his comment on the economy of time and money through the thorough organization of the department and the adequate delegation of duties. He calls particular attention to the human side of industrial medical work. The worker must be made to feel that his interests and those of the medical department are identical. Although a great many cases pass through the various agencies of this department, it must be definitely understood that each case is one which deserves individual consideration and sympathetic treatment. — C. H. Paull.

THE EXPERIENCE OF THE MEDICAL DEPARTMENT AT NITRO, WEST VIRGINIA. *J. A. Watkins.* Mod. Med., April, 1920, 2, No. 4, 293–297; May, 1920, 2, No. 5, 370–377; June, 1920, 2, No. 6, 432–437; July, 1920, 2, No. 7, 494–497. — This series of articles under the general title indicated present an account of the development and administration of the work of the medical department at Nitro, West Virginia. On Jan. 1, 1918 the site of Nitro was occupied by farms. One hundred and eighty days later its industrial plant employed 22,000; it was a city of 1200 homes with schools, churches, a theatre and a bank. The two great problems which faced the men in charge of the medical work were (1) the variety and shifting character of the population, and (2) certain health conditions dependent upon the locality and upon the facilities which could be afforded in the development of so large a project in so short a time. The size of the undertaking can perhaps be best understood by remembering that

in the middle of February the personnel of the medical department consisted only of the medical officer in charge. By the middle of November of the same year this force had grown to 800 persons, including medical officers, nurses, hospital employees, X-ray and laboratory technicians, and an administrative and clerical force to carry on the ever-increasing sanitary work of the community.

The work of physical examination and medical supervision was developed with the following aims: (1) "The prevention of introduction of communicable diseases; (2) the avoidance of employment of persons who either by reason of physical or mental disability might be a factor in the causation of accidents; (3) the discovery of remedial defects, in order that proper medical and surgical steps could be taken; (4) the determination of mental and physical status of the applicant for employment; (5) the exclusion of those who, either by reason of physical or mental disability were incapable of performing labor of the type which was available; (6) the discovery of venereal infections and other infectious diseases; (7) to bring individuals into close contact with medical officers."

After examination, applicants for employment were classified as follows: (1) permanently rejected; (2) temporarily rejected; (3) enrolled with disability noted; (4) certified for specified employment.

Applicants for physical examination were first sent to the dressing room where they stripped completely, placing all their clothing in a large canvas bag and valuables in a small bag. From here they went to the shower bath where they were given soap and towel, being under the observation of an attendant. From here they proceeded to the record clerk where they were weighed. In the examining room a complete physical examination was given, and each individual was vaccinated against smallpox and inoculated for typhoid. A thumb print was also taken in the examining room. After passing from the examining room the applicant was given his clothing which, in the meantime, had been searched for vermin and drugs and thoroughly sterilized. The following is a summary of the results of physical examinations:

Total number rejected	621	or 0.8 per cent.
Temporarily rejected	6,697	or 8.8 per cent.
Immediately passed and employed	69,680	or 90.4 per cent.
Total passed and employed	76,377	or 99.2 per cent.
Total number of men examined	76,998	
Total number of examinations made	94,438	

Other summaries are included in this article giving detailed causes for temporary and permanent rejections, women enrolled with disabilities, etc.

The activities of the industrial hygiene service included (1) "general activities which had to do with the organization and maintenance of conditions which are applicable to industries in general; and (2) special hygienic measures which dealt with conditions brought out because of the special industrial processes carried on at Nitro."

Workmen and their dependents were housed in Nitro either in barracks or in bungalows. There were sixty-seven barracks and 1253 bungalows. In the barracks careful supervision of living conditions was placed in the hands of inspectors, one being assigned to each of the barracks. Special supervision of mess halls was maintained and bi-monthly examinations of all employees made.

Unusually drastic measures were instituted for the prevention of communicable diseases. Special care was taken to discover and segregate for treatment cases of venereal infection. The data recorded in connection with this work are particularly enlightening.

In the early days of the work at Nitro the water supply was quite inadequate. Typhoid fever had been prevalent in the vicinity for a number of years. The milk supply was limited and unsafe. A total of 105 cases of typhoid received medical attention, though only fifty-one were confirmed by laboratory diagnosis. A study of these fifty-one cases tended to show that immunity through the use of vaccine comes only some time after the completion of the treatment.

The carrying on of emergency relief work throughout the plant was complicated by the area covered. The first-aid activities of the medical department followed two lines: (1) "The organization and maintenance of suitable locations throughout the plant of first-aid apparatus, equipment, and material; (2) the instruction of the better informed employees . . . in standard and approved methods of procedure in rendering relief." A summary table is given in the July installment of this article of all injuries, which numbered 10,697. More than 3,000 ambulance calls were answered. Twenty per cent. of all calls were made during the first hour the men were at work and 16 per cent. during the last hour of work. The remaining 64 per cent. were fairly evenly distributed over

the working time, except that 90 per cent. of the sick calls came about midnight.

The July installment also contains a brief discussion of the various types of injuries treated in the general hospital. — C. H. Paull.

The Service Department of the R. K. LeBlond Machine Company. *Sanford De Hart.* Mod. Medicine, May, 1920, 2, No. 5, 365–368. — In this plant the social service department and the hospital department are under separate management. The hospital department is housed in nine rooms: waiting room, first-aid room, bacteriological laboratory and operating room, office, dental room, dark room for eye work, bedroom and sterilizing room. The hospital department was organized to accomplish two purposes: (1) to take care of all injuries with the greatest expedition; and (2) to supervise the health of the workers. It also furnishes a means of contact between the workers and the management. With a working force of 1000, this plant during 1919 furnished 15,183 treatments. During the year no permanent disabilities were incurred. This is unusually noteworthy in that machine shops are particularly productive of finger losses. Eye cases showed a marked falling-off both in number and severity. A total of 190 days was lost on account of accidents.

A fully equipped dental department is maintained under the supervision of a dentist who spends one hour a day at the plant. Besides the corrective work done by the dental department, propaganda in the form of instruction and literature is furnished to the employees. During 1919, 1506 mouths were examined and charted. Ninety-six per cent. of these cases needed dental service. The approximate cost of maintaining this service was about $1.12 per employee. The estimated saving to the company on extractions alone is given as approximating $2200 in production.

The work of the social service department is grouped under six headings: (1) follow-up of absences; (2) assisting workers in financial matters; (3) assisting workers in settling family or other difficulties; (4) co-operation in the work of the Mutual Aid Society; (5) furnishing legal aid and advice in buying homes; (6) aid to those desiring to become citizens. Included in these duties of the social service department is the maintenance of a restaurant.

The possibility of obtaining absence rates to serve as a barometer of the hygienic conditions in a department is complicated by such factors as age of employees, sex, unsatisfactory home conditions, diet, and nationality.

In this particular plant the American workers had a lower absence rate due to illness than any other nationality. — C. H. Paull.

Plant Hospital of the Goulds Manufacturing Company. *H. G. Meacham.* Mod. Med., Sept., 1920, 2, No. 9, 608. — A high order of industrial production demands the speedy restoration of an injured or sick workman. Heretofore, careless and crude methods of attending to injuries, by causing infection, have done much harm. By way of contrast with these earlier and cruder practices, the writer describes a hospital erected in 1919 by the Goulds Company. A floor plan of the building is shown, and two photographs and details are given of the method of recording and reporting accidents, etc. — G. E. Partridge.

An Industrial Dental Dispensary. *H. M. Brewer.* Mod. Med., July, 1920, 2, No. 7, 492–494. — The work of the dental dispensary in the National Cash Register Company includes first-aid treatment, gum treatments, prophylaxis, extraction of diseased teeth and roots, X-ray diagnosis, temporary fillings, consultation and advice. Besides the actual dispensary work, literature on the care of the teeth is distributed among employees, and illustrated lectures are furnished from time to time. There is no attempt to provide restorative dentistry, although all the employees whose teeth are examined are furnished with charts indicating the work which should be done. In speaking of the return which this work brings to the company, the writer indicates that there is no quantitative measure of increased efficiency or improvement in regularity of attendance. In quoting several cases, however, he is able to show that the efficiency of the worker is retarded not only through disturbances easily identified with defective teeth but also through more remote disturbances, such as rheumatism, which at times have their original cause in the condition of the mouth. One case of arthritis in the right shoulder was satisfactorily treated by the extraction of several teeth.

A record of the work of the dispensary at Dayton for the year 1919 includes the following: examinations, 1777; prophylaxis, 1726; extractions, 1685; first-aid treatment, 1173; gum treatments, 430; temporary fillings, 94; X-rays, 76; consultations, 166; miscellaneous,

1183. This work was performed by two dentists. One of the most successful features of the work has been the close co-operation between the medical and the dental departments. At the present time an active campaign in oral hygiene is being carried on for the children of employees. These children are encouraged to attend talks on health habits given at Saturday morning meetings. The teeth of these children are also examined. It is the feeling of the writer that an adequate appreciation of dental hygiene can be inculcated satisfactorily only by beginning with children of the school age. — C. H. Paull.

How Armour & Company Supply Dental Service. *Louis P. Cardwell.* Hosp. Management, April, 1920, 9, No. 4, 64. — The scope of work in the dental department of Armour & Company is advisory, educational and prophylactic. Emergency work is treated as conditions indicate. Advisory work consists of a thorough examination of mouth and teeth, with suggestions as to proper treatment. Educational work consists of explaining to each patient the details of his case. Especial emphasis is laid upon prophylactic and correctional treatment to restore the mouth to a clean, healthy condition. — L. A. Shaw.

INDUSTRIAL NURSING

The Public Health Nurse in Relation to the Modern Industrial Hygiene Movement. *W. Wright.* Pub. Health Nurse, June, 1920, 12, No. 6, 520–525. — There is now some degree of common belief regarding the purpose, methods and standards of public health nurses. As to industrial hygiene, it seems that the notions are more vague. The majority of industrial nurses at the present time are "surgical dressers and dispensers of pills." Health in industry, however, depends upon various factors, many of which must come under the control of the industrial nurse — such factors as the subtle effects of all bad working conditions, poor lighting, inadequate ventilation, faulty posture, fatigue, lack of recreation, improper nutrition, worries, fears, congenital defects, tuberculosis, venereal disease and other infections. The conditions at present are bad; we have exploited our people in the industrial life; there is great loss from sickness; and there is a great amount of work to be done to make conditions right. The opportunities for preventive measures in industrial life are many and great, and the nurse will normally take a large part in the work of reform. Much of the progress already made in industrial hygiene is due to the nurse and it will be the same in the future. The capacity for usefulness of an industrial nurse will depend upon her personality, her technical training, her vision and imagination, and upon her willingness and eagerness to grow. One of the most vital functions of the industrial nurse will be teaching, and this makes large demands on ideals and training. — G. E. Partridge.

The Factory Nurse and Industrial Supervision. *W. Pryll.* Zentralbl. f. Gewerbehyg., June, 1920, 8, No. 6, 107–109. — The latest report of the Prussian Industrial Council recognizes fully the value of the work of the industrial nurse, but leaves open the question whether industrial nursing is to be a permanent institution, or is only a war measure — to disappear now that the chief motive for its introduction, the presence of a great number of women in industry, is no longer existent. The writer of the article holds the view that this work ought not only to be maintained, but to be extended and gradually brought under legal provision and given state backing. For Germany's work of reconstruction, sound men are needed and the need and the opportunity for prophylactic sanitation are greater than before the war.

The place of the factory nurse is in the shop. Here her work is a broad and complex one. It includes the sanitary protection of the workers and attention to social problems that arise in the factory. The nurse must take part in the work of overcoming specific dangers to health, and in the periodic medical inspection and the like that must be carried on. Tuberculosis and syphilis and other sources of contagion must be kept under control. The importance of the work of the industrial nurse creates a problem of selection of personnel for the work. Industrial nursing is rather an art than a science, and much depends upon the qualities of the nurse. Also she must be free from too much dependence upon employer or worker for the security of her position, and this is one of the reasons why the work needs state backing. The form which this state control or aid shall take is a matter for later consideration, but in some way industrial nursing must become a part of the

whole system of industrial supervision. — G. E. Partridge.

How the Factory Nurse Helps the Employment Manager. *Samuel N. Comly.* Factory, Sept. 1, 1920, 25, No. 5, 694–695. — This is a brief statement of the procedure followed in looking up absence at the Russell, Burdsall and Ward Bolt and Nut Company's plant. After the workers arrive in the morning, it is the duty of the foreman to take all time cards from the "out" rack. These cards are sent to the employment department. In the employment department is an "absence investigated" card for each worker. From the absence investigated file are taken the cards which correspond to the time cards of the absentees. After noting on the cards any reasons for absence offered by the foreman, they are turned over to the nurse for investigation. The nurse investigates the absence, stating briefly on the card the result of her look-up. She also makes a fuller report in triplicate, one copy going to her file, one to the employment department's file, and one to the foreman. By this method information flows freely between the foreman, the employment department, and the medical department, making full co-operation possible.—C. H. Paull.

INDUSTRIAL INVESTIGATIONS AND SURVEYS

Industrial Survey in Selected Industries in the United States, 1919. Preliminary Report. Prepared under the supervision of *Allan H. Willett.* U. S. Bur. Labor Statis., Bull. No. 265, May, 1920, pp. 509. — This bulletin contains a summary report on the wages and hours of labor in the following industries: automobiles; paper boxes; brick; cars; chemicals; cigars; men's clothing; women's clothing; coal; confectionery; electrical machinery; foundries; furniture, glass; hosiery and underwear; iron and steel; leather; logging; lumber; machine tools and other machinery; millwork; overalls; paper and pulp; pottery; rubber; silk; and typewriters.

Since this pamphlet consists largely of elaborate and very numerous tables of average hours worked per week day and earnings per hour worked in the various industries classified by sex and occupation of employees, pay-roll period and locality, no attempt will be made to review its contents in detail. The interested reader is referred to the original. — K. R. Drinker.

Some Observations on Bobbin-Winding. *S. Wyatt.* Industrial Fatigue Research Board, Report No. 8. Textile Series No. 2. His Majesty's Stationery Office, London, 1920, pp. 40. — "Since this investigation was restricted to the bobbin-winding department of a single mill, any conclusion set forth must necessarily relate to the conditions existing in this mill, and not the industry as a whole. The chief points observed in the course of this investigation are:

"1. The conditions of labour were found to be generally satisfactory and with the possible exception of the distribution of the reduced number of working hours, it is concluded that these conditions were not calculated to favour the development of unnecessary fatigue. Possibly an unbroken working spell of four and a half hours is too long, but the provision of tea at about the middle of the afternoon spell is beneficial and is a practice worthy of a wider adoption.

"2. The ventilation of the winding room was not satisfactory because of the inadequate movement of the air. As a consequence, the cooling power of the air was insufficient, and the stimulating effect of air having a moderate and variable rate of movement was entirely lost, so that although the temperature and humidity were not unduly high, it is probable that the conditions accelerated the development of fatigue in the operatives.

"3. Defective organisation, which resulted in the arrival of the ring yarn to the winders being delayed, not only diminished output, but also tended still further to reduce the efficiency of the winders, either by producing loss of interest in the work, owing to the annoyance or worry caused by the necessity of spending unremunerative time at the mill, or by producing unnecessary fatigue, owing to the adoption of a physiologically uneconomic rate of working in the effort to make up for lost time.

"4. Certain improvements in the design of the machinery used in bobbin-winding appear to be necessary in order to decrease the nature and extent of movements made by the operatives under the existing conditions. These improvements should also include, if possible, the automatic performance by the machine of cer-

tain operations at present included in the manual operations of the winders. Greater efficiency could be secured if the organisation of the work relieved the winders of the necessity for performing the heavy auxiliary operations involved in the process of bobbin-winding.

"5. Considerable individual differences in efficiency were found to exist. These may be due either to individual differences in ability and method employed, or to differences in temperament. Further standardization of the methods of work is possible, but not necessarily advisable, since the human organism itself does not exactly conform to a rigid type. The best method for one individual is not necessarily the best for all. Each operative exhibits a natural tendency to discover and adopt a method which, to him, is the most suitable, but there are differences in ability to discover this method. Careful selection of the workers, and individual rather than group training, is necessary in order to secure maximum efficiency.

"6. A noticeable and very satisfactory feature was the good feeling which existed between the management and operatives in the winding department of this mill. A general state of contentment and industry prevailed which was chiefly due to the tact and sympathetic behaviour of the overlooker." — C. K. Drinker.

INDUSTRIAL PSYCHOLOGY AND INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS

Proceedings of the Twenty-Eighth Annual Meeting of the American Psychological Association, Cambridge, Massachusetts, December 29, 30, 31, 1919. *H. S. Langfeld.* Psychological Bull., Feb., 1920, 17, No. 2, 33–82. — Several of the papers read at this meeting are of interest from the standpoint of industrial hygiene. J. E. Anderson reported studies of physical and mental work in which circulatory changes in the arm were tested by means of the Lehmann arm plethysmograph. Nearly a score of the papers presented dealt with the problem of intelligence and closely related subjects. F. A. C. Perrin presented some results of an investigation of the relations of motor tests to estimates of character, mental test scores and scholarship grades. He concludes that motor ability is not general, but definitely localized; that a complex motor performance is not to be explained primarily in terms of a number of specific motor functions; that the type of intelligence measured by mental tests and by university grades fails to correlate in any significant way with any of the motor tests (tests of elementary processes), but factors best described as intelligence factors contribute primarily to superior ability in complex motor tests. The assumption that there are general traits of character which can be used as explanatory principles in the analysis of motor ability is justified only in part.

W. V. Bingham reported on group tests, and there were several papers dealing with the relation of tests to school and college work. F. L. Wells contributed an important investigation of the intelligence quotient of patients suffering from mental troubles. The median in 102 cases was found to be 88, "entirely compatible with normal self-maintenance." An intelligence quotient as high as 119 was noticed in adults conspicuously incapable of self-maintenance. The conclusion is that above a necessary minimum the value of intelligence for general adaptation depends greatly upon the support of other factors in the personality. Intelligence scales measure essentially ability to deal with ideas, as distinct from ability to deal with things or other persons. Psychotic breakdowns are essentially failures of adjustment to the social environment. A. F. Bronner maintained that variations in mental equipment are not indicated by an intelligence ratio; that group testing has very specific values, but that it also has distinct limitations. The function of clinical psychology is largely that of individual diagnosis. Extremely varied special problems are presented to the clinical psychologist, which require special study, presumably, by means of special tests.

H. L. Hollingsworth reported on the psychology of the functional neuroses, F. Mateer on the psychological detection of syphilis, asserting that certain characteristic findings during psychological tests make possible a diagnosis of syphilis. The problems of the clinical psychologist were discussed by D. Mitchell, and the use of psychological tests in the training of teachers by E. A. Kirkpatrick. Psychological tests of aviators, as used in the A. E. F., were discussed in a paper by F. C.

Dockeray and S. Isaacs, and the ocular functions as related to the look-out and signal service of the Navy by C. E. Ferree and G. Rand. What industry wants and does not want from psychology was the subject of a paper by E. Frost, and recent developments in trade test theory, a paper by A. Kornhauser and B. Ruml. Two other papers, one on the extension of rating scale theory and technique, by D. G. Paterson and B. Ruml, and the other on an important constant error in psychological rating, by E. L. Thorndike should be mentioned in the present connection. — G. E. Partridge.

Movement toward Vocational Psychology in Germany. *W. Stern.* Ztschr. für pädagogische Psychologie und experimentelle Pädagogik. March–April, 1917, 18, Nos. 3–4, 156–158. — Stern records that the movement of interest toward vocational psychology has recently been very rapid in Germany. The military department has taken the lead and has made a thorough application of results previously obtained by psychologists. In the industries also there is a wide interest in practical psychology and many tests that have been used in the service — in examining aviators, to take a single example — have now become available in testing industrial groups. Tests are being made in Leipzig in the printer's trades with reference to measuring the special abilities used in these occupations. The paper contains information about recent developments in the teaching of practical psychology. — G. E. Partridge.

INDUSTRIAL SERVICE AND MUTUAL BENEFIT ASSOCIATIONS

The Westinghouse Lunch Club. *W. W. Rodgers.* Mod. Med., Sept., 1920, 2, No. 9, 610–611. — In recent years manufacturing plants all over the country have opened cafeterias for their employees, giving wholesome food at a low price and served under sanitary conditions. Research work has shown that many workers are subnormal from eating unwholesome food, even the home lunches being often lacking in nutritional qualities. These conditions the cafeteria has helped to change, and it has also done away with the small restaurants that spring up about large factories.

Recently the Westinghouse Company opened the largest industrial restaurant in the world. The building has a seating capacity of more than 3200. The first floor is given over to women employees who carry their own lunches; there is a cafeteria for men and women on the second floor; and the third floor is occupied by a large dining room and an auditorium. The building has many new features — such as ramps instead of stairways — and both kitchen and dining rooms have been equipped with sanitary, labor-saving devices that enable a comparatively small force to serve hundreds of people in a short time. The lunch club is not self-sustaining, but is run at a loss in order to furnish food to employees at the lowest possible price. — G. E. Partridge.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

New York State Workmen's Compensation Law with Amendments, Additions and Annotations to August 1, 1920. Prepared by the Bureau of Statistics and Information, New York State. Pp. 114. Court Decisions on Workmen's Compensation Law, July, 1919–June, 1920: Subjects other than Constitutionality and Coverage. New York State Department of Labor, Special Bulletin No. 98, July, 1920, pp. 113. Comparison of Workmen's Compensation Laws of the United States and Canada up to January 1, 1920. *Carl Hookstadt.* U. S. Bur. Labor Statis., Bull. No. 275, Sept., 1920, pp. 140. Decisions of Courts and Opinions Affecting Labor, 1918. U. S. Bur. Labor Statis., Bull. No. 258, Dec., 1919, pp. 239. New York State Labor Law with Amendments, Additions, and Annotations to August 1, 1920. Prepared by the Bureau of Statistics and Information, New York State, pp. 191. New York Labor Laws Enacted in 1920. New York State Dept. Labor, Special Bull. No. 99, June, 1920, pp. 93. — The above titles are listed for the information of persons interested in labor and workmen's compensation laws. — K. R. Drinker.

FEE SCHEDULES UNDER WORKMEN'S COMPENSATION. Mod. Medicine, July, 1920, 2, No. 7, 498–499. — After prolonged consideration a new schedule has been established by the Industrial Commission of Ohio affecting medical and surgical fees under the Workmen's Compensation Act. This schedule is of particular interest in that the Ohio Compensation Act is universal and compulsory and all industrial accidents come within its scope. The complete schedule is reprinted. Some of the items are as follows:

Minor injuries (first dressing) day, at office	$3.00
Minor injuries (first dressing) home or hospital	5.00
Minor injuries (first dressing) night, 9 P.M.–6.30A.M	7.00
Minor injuries (subsequent dressing) at office	1.50
Removal of foreign body (eye) ordinary	2.00
Herniotomy — single (including after care)	75.00
Shoulder dislocation (including reduction and subsequent treatment)	35.00
Clavicle dislocation (including reduction and subsequent treatment)	50.00
Knee dislocation (including reduction and subsequent treatment	50.00
Finger dislocation (including reduction and subsequent treatment)	10.00
Fracture — 1 bone of the forearm (including subsequent treatment)	50.00
Femur (including subsequent treatment)	100.00
Amputation — leg at knee or above	75.00 to 120.00
Extraction of foreign body from inside of eyeball, with or without magnet	50.00 to 75.00
Refraction	5.00 to 10.00

— C. H. Paull.

AMENDMENT TO THE WISCONSIN COMPENSATION LAW. Hosp. Management, April, 1920, 9, No. 4, 70. — An amendment to the workmen's compensation act of Wisconsin has made compensable all diseases which arise while the injured employee is performing services growing out of and incidental to his employment. The amendment does not enumerate the particular occupational diseases included in the law, but it is held to be of no importance whether an injury is an accident or an occupational disease. Hitherto if such disease could not be traced to result of accident, compensation was not allowed. — L. A. Shaw.

LEAD POISONING FROM THE STANDPOINT OF INSURANCE LEGISLATION. *Hans Betke.* Concordia, July 1, 1920, 27, No. 13/14, 133–136. — The author discusses in some detail the incidence of lead poisoning in some industries, the relative importance and medical difficulties in the diagnosis of the chronic form of the poisoning, the symptomatology of the disease, and the large number of industries concerned. He then shows that the existing accident insurance laws allow small fractions of the total lost earnings to men who are totally disabled by lead poisoning, and that such pensions are available only after payment of premiums for 200 weeks. Accidents are much better compensated, and compensation is available at once. Although England and Switzerland include lead poisoning with accidents in industries, he cites opinions and discussions to show that there are difficulties in this method and that lead poisoning should be classed as an industrial disease. Lead workers must be protected from becoming public burdens.

Statistical studies will be needed; lead poisoning and certain infectious diseases must be made reportable. It may be asked to have lead poisoning included in the present accident provisions as have been poisoning from nitrocompounds and from war gases. Since this is only a temporary expedient and would involve similar pleas for such poisons as zinc and mercury a new law on industrial poisons is highly desirable. It should provide for medical treatment, withdrawal from work, pensions until the earning power is re-established, and hygiene in the plants to avoid poisoning. The medical profession should try to eliminate the unfit from lead work. Steps should be taken to get the whole body of physicians more familiar with lead poisoning. — E. L. Sevringhaus.

REHABILITATION OF DISABLED EMPLOYEES

THE LAW OF MAY 6, 1920, ESTABLISHING PUBLIC CARE FOR CRIPPLES. *Schlossmann.* Deutsch. med. Wchnschr., July 18, 1920, 46, No. 29, 803. — The provisions of the new law establishing extensive care for all cripples under 18 years of age is discussed at some length by the author. "No one in Prussia shall be crippled, if it is possible to avoid it. No cripple who can be cured or 'improved shall be denied the possibility of cure or improvement. No cripple who can practice any calling shall remain without means of livelihood. No cripple who lacks care, attention, or medical service shall be denied these. This is the soul, intent and meaning of the law concerning the care of cripples of May 6, 1920." — T. J. Putnam.

Re-Vocational Centers. *Christine R. Kefauver.* Month. Bull., Dept. Health, New York City, May, 1920, 10, No. 5, 119–121. — The great need of the time is production and economy. The new policy of utilizing waste products has resulted in the last quarter of a century in the building up of many important industries. Labor might well follow the lead of capital in this respect and give attention more to the work of salvage — the re-education or reconstruction of the human material which at the present time is largely waste in industry. The greater part of industrial misfits can be traced to physical conditions, of the existence of which, in most cases, the persons afflicted are unaware. Labor maintains, and with some truth, that physical examinations have been used in the past to the disadvantage of those who were examined, but this is no reason why labor should deprive itself of the benefit of so valuable an aid as physical examination, which becomes more and more important as industry becomes complex and people depend upon the efficiency of one another in their daily work.

Occupational clinics were organized in New York City several years ago for the examination of food handlers, all persons having anything to do with the handling of food being required by statute to be examined at least once a year by the physicians of these clinics or by their private physicians. The general good of such work is obvious and, in much the same way, we may be justified in demanding that the lives of our citizens be not unnecessarily endangered by fellow-workers who suffer from physical defects. The movement toward improvement in this direction ought to originate in the unions, and the main requirement is for the establishment of vocational centers in which workers, shown to be unfit for the tasks in which they are engaged, could be taught other trades in which their handicaps would not be a drawback. These re-vocational centers could also take over the training of victims of industrial accidents who might be unable to return to their original occupations.

In regard to the danger that physical examinations may be used to the detriment of the worker, the method adopted by the Division of Industrial Hygiene of the New York City Department of Health is offered as a solution. Lectures on health are given in the shops, sometimes in the noon hour, sometimes in the employer's time. The advantages of physical examination are explained and the workers are given opportunity to make application for examination. These examinations are confidential, and the name of the person examined does not appear on the record, unless it is especially requested. If defects are found, the worker is advised how to correct them and what processes in the work, if such exist, are responsible for the troubles. — G. E. Partridge.

Putting the Ex-Consumptive Back on the Job. Bull. N. Y. Tuberculosis Assn., Inc., Oct., 1920, 1, No. 7, 1–4. — "The all too frequent recurrence of tuberculosis, among those whose disease has been apparently arrested by sanatorium or other treatment, has long been a problem calling for solution. The commonest cause of such relapses has been the return from ideal sanatorium life to the same unfavorable working and living conditions under which the disease first started. The sudden change from absolute rest to a full day's work — without a hardening process — is almost equally dangerous. The situation must be met by the gradual utilization of occupation therapy and vocational training, at the sanatorium in the country, followed, in town, by industrial rehabilitation at a sanitary workshop and by improvement of home conditions.

"The Federal Board for Vocational Education, having a large number of ex-service men suffering and recovering from tuberculosis, and recognizing the above facts, proposed to the National Tuberculosis Association and the New York Tuberculosis Association that a workshop for such industrial rehabilitation be established in New York City.

Model Workshop in Long Island City

"The New York Tuberculosis Association, after preliminary investigation of suitable trades and the best location, opened, on June 15, 1920, a model workshop in Long Island City for the training, under ideal sanitary conditions, of arrested cases of tuberculosis. It is incorporated under the name of the Reco Manufacturing Company, and is under the direction of an active committee of public spirited business men, headed by Mr. Fred M. Stein, who established some years ago the Altro Shop, the first successful workshop of this kind for the needlework trades.

"The shop has now been running five months. It is situated in the newly developed manufacturing section of Long Island City, in the Borough of Queens. The building is new,

has light and air on all sides, is up to date in every respect, and is within five minutes' walk of the subway from Manhattan. The plant is on the third, and highest, floor of the building. The workrooms have large windows on all sides, and there is a maximum of air and sunlight for its occupants. The shop is equipped with hygienic and sanitary fixtures.

Admission Requirements

"At present only men with arrested or quiescent tuberculosis and negative sputum are received by the Reco Manufacturing Company. The men now under training are largely ex-service men, but civilians who are suitable patients and anxious to take up any of these trades will be accepted if they are prepared to spend the full period of apprenticeship. They should apply or be referred to the Manhattan Office, at 10 East 39th Street, at 9 A.M., daily, except Sunday. Properly qualified visitors are always welcome and arrangements for such visits will be made on request.

Medical and Social Supervision

"All applicants are subjected to a thorough medical examination before admission. Close and exhaustive histories of each patient are taken and the effects of the work carefully noted; but, it is a workshop and not a sanatorium, rest-camp or health school. Care is taken that the medical and social work, while thorough, is not obtrusive. All examinations are made in Manhattan at the offices of the New York Tuberculosis Association. After a man is admitted to the shop and has started training, he is re-examined at the end of the first week and later once a month to determine the effects of the work. If his condition is at all questionable he returns oftener. In case of a relapse men are returned to the sanatoria or hospitals for proper care. Only one such case has occurred so far. Close supervision is kept of all men under training by means of these periodic examinations, and also by the trained nurse, who is at the shop several hours daily and takes temperature and weight of each man weekly.

"The amount of work that each man is first allowed to do, as well as any increase of it, are specifically prescribed by the medical officer. A first aid kit is kept at hand; the nurse's room has a couch and emergency facilities in case of need.

"It is intended that the shop be like any other well-conducted factory, with the added fundamentals of teaching non-injurious, well paying trades, by part or full time training under strict medical supervision, and under the best obtainable hygienic surroundings. A cafeteria lunchroom has been installed and nourishing meals are served at cost. A rest room will be provided on the roof, protected and furnished with reclining chairs, tables and reading matter. The men are encouraged to rest after their lunch and work periods.

"The home conditions of the men receive equal attention. Much of the good work may be undone at the home, where bad conditions beyond the patient's capacity to remedy may be present. A trained social worker investigates and visits regularly the home of each man. The benefit of her experience and advice is freely given; the best use of the rooms and resources available are pointed out. Family cares and worries are cheerfully shared; children in need of building-up are cared for; the advice of the physician is emphasized and followed up.

Trades Taught

"The trades selected to be taught at the shop are watch repairing, jewelry manufacturing and cabinet making; these were chosen only after careful investigation. They are deemed most desirable because not injurious to the lungs nor especially fatiguing. Workmen in these trades are very well paid and there is a great demand for men skilled in these particular occupations. The instruction is carried out by experienced men who are experts in their respective trades. According to conservative experience, the present wages men may earn in these trades are from forty to seventy-five dollars a week.

"When the students in the shop have gained enough skill to do marketable work they are paid wages on a piece-work basis. The skill that some of the men have developed has been surprising; without any previous mechanical experience, some have become proficient enough to make salable articles within two and a half months on only part time training.

Ideals in View

"It is the intention to make the city model workshop the last step in the training and treatment of the tuberculous. Schools for pre-vocational training in certain sanatoria (Loomis, Otisville and Gaylord Farm) are conducted by the New York Tuberculosis Association, where

preliminary instruction is given to the sanatorium patient and he is prepared for transfer to the workshop as soon as his physical condition warrants. In this way the harmful gap of uncertainty following discharge is bridged. A record of his work at the sanatorium is kept and forwarded to the workshop. This prevocational training decreases the amount of time a patient will have to stay in the sanatorium, through the curative effect that it will have on his disease, provided he is interested in the trade. It also shortens his time at the shop because he enters with a grounding in his trade, experience with the special tools required, and is therefore ready for advanced instruction and will begin receiving wages all the sooner.

"It is the aim to gradually increase the working hours of the man with arrested tuberculosis until he can do a full day's work; to teach him a well-paid trade, keeping him all the while under medical observation until his ability and physical condition warrant discharge; finally, to find him a suitable position. Thus trained, hardened and re-established in life, his chances of again falling a victim to tuberculosis will be minimized, and he can take his place in the community as a healthy, self-respecting, self-supporting citizen."

ABSTRACT OF THE LITERATURE

OF

INDUSTRIAL HYGIENE

VOLUME II FEBRUARY, 1921 NUMBER 10

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GENERAL

ECONOMIC ASPECT OF INDUSTRIAL HYGIENE. *Bernard J. Newman.* Indust. Management, Oct., 1920, 60, No. 4, 271–273. — The writer points to the fact that there is a definite connection between the development of industrial relations and problems of public welfare. Because society has recognized that industry is a source of certain health and accident hazards it has tended more and more to place remedial responsibility upon the source of the hazards. During the early development of medical departments there was a tendency to pay small salaries to physicians. This led to a great deal of perfunctory medical work. Later developments, however, have shown industry the value of obtaining medical service of a higher standard that would not only look after the routine of the medical department, but would have the capacity and willingness to carry on research and assist in developing policies. The writer feels that the selling qualities of this higher type of industrial hygiene depend largely upon their ability to show a "profit for production."

Industrial hygiene implies that "factory working conditions should conform to the laws of health." Industrial hygiene would, therefore, safeguard the worker from injurious consequences attendant upon his work. This would definitely connect the medical department with all problems of sanitation, the protection of the worker against the "dangers of dusts, gases, fumes, excessive heat or cold, abnormal temperature and humidity, fatigue, excessive glare or light intensity or gloom."

The writer goes on to point out that one of the great factors in working efficiency is the health of the individual. Those things which interfere with health break up the balance which determines the individual's complete effectiveness. Where a group of adverse conditions exist there develops a complex of disturbances which may or may not bear a definite relation to the elements. Industrial losses extend far beyond mere interference with speed of production where unhygienic factors are involved. There are problems of intermittent employment due to accident and ill health; labor turnover tends to increase; where skilled or semi-skilled labor is employed the cost of training and the hazard of employing new

workers is augmented. Danger goes even a step further and exhibits itself in low morale. Where the worker is physically unhappy he becomes mentally unhappy, and may show signs of sullenness, lack of co-operation or soldiering.

In conclusion the writer states "it is a misconception to attribute the cost for the establishment and maintenance of hygienic working conditions to the debit account. They are part of the investment, and if carefully supervised yield financial returns through the increased efficiency and sustained production of the workers." — C. H. Paull.

Sickness and Absenteeism during 1919 in a Large Industrial Establishment. *Dean K. Brundage.* U. S. Pub. Health Ser., Pub. Health Rep., Sept. 10, 1920, 35, No. 37, 2143–2154. — This is the report of the experience of an eastern manufacturing company employing 6700 workers. This concern follows up absence after the second day. It pays sickness and non-industrial accident benefits to workers incapacitated for more than seven consecutive days. The working time lost from all causes totalled more than 115,000 working days. In terms of lost time per employee this means $17\frac{1}{10}$ working days. The following table shows the per cent. of working time lost by months classified according to causes:

Month	All Causes of Absence	Sickness	Personal Reasons	Industrial Accidents	Non-Industrial Accidents
January	5.39	1.51	3.50	0.28	0.10
February	5.14	1.64	3.27	0.17	0.06
March	6.27	2.13	3.88	0.20	0.06
April	6.95	2.54	4.27	0.02	0.03
May	7.69	1.78	5.65	0.16	0.10
June	4.70	1.60	2.90	0.10	0.10
July	4.72	1.39	3.10	0.16	0.07
August	5.13	1.51	3.34	0.19	0.07
September	5.71	1.79	3.77	0.14	....
October	5.80	1.80	3.70	0.20	0.10
November	5.20	1.67	3.29	0.21	0.03
December	6.03	2.01	3.82	0.15	0.05
Year	5.65	1.78	3.63	0.18	0.06

A study of Chart 1 given in the discussion as well as of the correlation figures indicates that there is probably a relation between the rate of absence and the sickness rate, though the relation between the sickness rate and the rate for other factors shows little correlation. — C. H. Paull.

Training for the Higher Industrial Supervision Service. *Jacobi.* Zentralbl. f. Gewerbehyg., Feb., 1920, 8, No. 2, 25–28. — Rasch, in a previous paper, has discussed the preparation for the industrial supervision service and has emphasized and favored the development of officials through practice. Candidates, after the completion of technical studies, act for two or three years as assistants in industrial supervision work, and then take the state examinations as required. This is similar to the Prussian plan for the training of chemists.

Jacobi takes exception to a considerable part of this program. We must guard against placing a too high estimate upon practical work. The usual shop work is apt to be beside the point. Also, at the present time, too much scientific training that is useless is given, while on the other hand much is omitted that is important and of direct value — such branches, for example, as industrial hygiene, and the legal subjects that enter into industry.

A suitable course of training for the higher industrial supervision and inspection would include, besides the purely mechanical and technical sciences, hygiene, accident prevention, economics, and law subjects. Some of the higher mathematics can be omitted, and other less practical work. A year and a half may be given to practice work in industrial supervision. Another half year should be devoted to the learning of the methods of other related administrative work such as various city and district departments. The course should so be arranged that it would be easy to change afterwards to other engineering professions, if for any cause such a change be desirable. The whole plan is flexible, and it is recognized that there is no one single way of educating for the professional work under discussion. What is wanted is the best trained personnel, but at the same time it is desirable to have men in the work as early as they are able to give good service. — G. E. Partridge.

Chronicles of Social Hygiene. *A. Elster.* Öffentliche Gesundheitspflege, April, 1920, 5, No. 4, 132–143. — This report, which is a review of current topics of social hygiene, contains a brief section on industrial poisons — a subject which, although lying outside the field

of infections which the writer is especially reviewing, needs, he thinks, to be considered in the same connection. On January 27 a new regulation was passed respecting processes in the preparation of lead colors and other lead mixtures. The order contains twenty-seven paragraphs in which the requirements are more sharply defined. On the same date there was a new interpretation of the law regarding lead working, and an order for medical inspection and supervision of the health of lead workers.

Francke has given a summary of the most important results contained in the annual report of the Prussian department of industrial supervision. The point is made that the effects of industrial poisons are increased in an extraordinary degree by poor working conditions and regulations, and are greatly lessened by proper care. As an instance is mentioned the dangerous work in dinitrobenzol, a work in which the good facilities of the large-scale producer have greatly reduced the hazards, while some makers, having so many cases of aniline poisoning as a result of inferior nitrification apparatus, have abandoned the work altogether. In one case, a war plant, established and conducted under poor conditions, had many severe cases while a well-conducted plant in the same district had only one or two light cases in a month. — G. E. Partridge.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

Cancer, with Special Reference to Sarcoma in its Relationship to Trauma. *Raphael Lewy.* Proc. 6th Ann. Meeting Internat. Assn. Indust. Accident Boards and Commissions, U. S. Bur. Labor Statis., Bull. No. 273, Aug., 1920, 238–244. — In 26,389 examinations there were found thirty-seven malignant tumors attributable to trauma. Sarcoma may develop early in life and develop without trauma. On the other hand, trauma may be the primary cause in its development, or may be the activating factor in its very rapid growth. Such trauma need not be severe nor disabling. It is sometimes referable to muscular exertion and not to direct force.

The interval between infliction of the trauma and the appearance of the first sign of sarcoma may be a week up to two years. Sarcomata of the joints, especially of the knee, have in their early stages been faultily diagnosed as rheumatic conditions. — Barnett Cohen.

CENTRAL NERVOUS SYSTEM

Need of Recognition of and Better Treatment for Mental and Nervous Injuries. *Francis D. Donoghue.* Proc. 6th Ann. Meeting Internat. Assn. Indust. Accident Boards and Commissions, U. S. Bur. Labor Statis., Bull. No. 273, Aug., 1920, 272–277. — "My sole desire at this time is to call your attention to the need of calling to the assistance of the boards [workmen's compensation] men competent to diagnose and advise treatment in this group of cases, and through them to encourage the further standardization of this group of cases. The present method of handling them, by exerting constant pressure from the insurance physician, insurance adjuster, or compensation commissioner, is not always a success." — Barnett Cohen.

NEUROMUSCULAR SYSTEM

Twisters' Disability in the Cotton Trade; Commonly Known as Twisters' Cramp. *J. C. Bridge.* Great Britain, Ann. Rep. Chief Inspect. Factories and Workshops for 1919, pp. 69–72. — The disability which occasionally attends the operation of twisting in the cotton trade produces a condition of the hand which either entirely prevents the workman thus affected from following this occupation, or compels him to work under a disability which precludes him from earning a wage commensurate with previous earnings. An outline of the operation of twisting is given and a discussion of the complex muscular action which this work entails.

The symptoms of twisters' cramp are: pain, generally referred to the base of the thumb, rarely extending up the arm; tenderness of the muscles; sometimes, swelling at the base of the thumb. Actual cramp is rare. Weakness and loss of power of the thumb is the prominent symptom, rendering impossible the final rolling over of the twisted ends of the thread in such a way as to produce a firm junction ("unable to finish twirl"). Fifty per cent. of the men examined showed an unusual flattening or apparent wasting of the thenar eminence (ball of thumb) or small muscles of the thumb.

The author believes the condition to be due to a widening in the controlling mechanism of the central nervous system plus a local chronic inflammation of the muscular tissue. — L. A. Shaw.

Elimination of Carbon Monoxid from Blood after a Dangerous Degree of Asphyxiation; Therapy for Accelerating Elimination. *Y. Henderson* and *H. W. Haggard*. Abstracted as follows from Jour. Pharmacol. and Exper. Therap., Aug., 1920, 16, No. 1, 11, in Jour. Am. Med. Assn., Oct. 9, 1920, 75, No. 15, 1024. — "It is shown by Henderson and Haggard that during the development of carbon monoxid asphyxia there is vigorous hyperpnea, and that thereafter, probably owing to deficient oxygenation and other causes, there is a diminished production of carbon dioxid. As a result of deficiency of carbon dioxid in the blood, asphyxiated animals when restored to pure air exhibit for half an hour or more a very marked depression of breathing. The rate of elimination of carbon monoxid is correspondingly slow. The condition of tissue asphyxia is thus continued, although the body is surrounded by fresh air. It is suggested that this postgassing period of continued asphyxia may be of critical importance in inducing subsequent structural degenerations and functional impairments. Its abbreviation is therefore an important object both for therapy and prophylaxis. Oxygen inhalation during this period has only a slight effect; it is not adequately inspired. Inhalation of carbon dioxid diluted with air has an immediate effect. It augments breathing and thus hastens the elimination of carbon monoxid. Inhalation of oxygen plus carbon dioxid is far more effective than either gas alone; for the augmented breathing allows the oxygen to effect a rapid displacement of carbon monoxid from the blood. Functional restoration is correspondingly accelerated." — M. C. Shorley.

Histopathology of Carbon Monoxid Poisoning. *R. M. Stewart.* Abstracted as follows from Jour. Neurol. and Psychopath., Aug., 1920, 1, No. 2, 105, in Jour. Am. Med. Assn., Nov. 20, 1920, 75, No. 21, 1455. — "The histologic appearances described by Stewart confirm the observation that in fatal cases of gas poisoning the brunt of the damage to the tissues falls on the central nervous system. The evidence is in favor of the view that carbon monoxid exerts its influence in two ways: (1) indirectly, by altering the coagulative power of the blood, and diminishing the oxygen supply to the tissues; and (2) directly, by a specific action on the parenchymatous elements of the nervous system." — K. R. Drinker.

Tumors of the Uropoietic System Observed in Men Working in Chemical Factories. Their Relation to the General Pathogenesis of Tumors. *R. Oppenheimer.* Abstracted as follows from München. med. Wchnschr., Jan. 2, 1920, 67, No. 1, 12–14, by S. Amberg in Chem. Abstr., Sept. 20, 1920, 14, No. 18, 2815. — "The author suspects in various cases, as possible producers of tumors, chiefly of the bladder, aniline, benzidine, aniline and naphthylamine, aniline and benzene and toluene, benzidine and aniline, benzidine and tolidine, aminonaphthol and cresoldicarboxylic acid, naphthylamine and cresoldicarboxylic acid. Twenty cases were observed. The tumors were papillomas and cancers. Tumors may occur in people who are not directly concerned with the manufacturing, but who work near by. It takes ten to twenty years to produce the tumors. Several other phases of the problems are discussed." — W. O. Fenn.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

Mechanism of the Poisonous Effects of the Aromatic Nitro-Compounds, together with a Discussion of the Respiratory Problem of Animal and Plant Cells. *W. Lipschitz.* Abstracted as follows from Zeit. physiol. Chem., 1920, 109, 189–258, by C. L. E. in Physiol. Abstr., Sept. and Oct., 1920, 5, Nos. 6 and 7, 327–328. — "Living cells can remove two atoms of O from insoluble nitro-compounds, such as *m*- or *o*-dinitrobenzene or dinitrotoluene. In this (endothermic) reduction the yellow *m*-nitrophenylhydroxylamines are formed; these are powerful poisons, the administration of which leads to morphological blood changes as well as to chemical alterations such as formation of met-Hb. Any condition which hinders cell respiration, such as impairment of cell structure, narcotics, HCN, high tempera-

ture, or removal of the thermostable co-ferment by washing, at the same time removes the power to form nitrophenylhydroxylamines; *m*-dinitrobenzene was employed as a sensitive reagent for the measurement of respiratory power in experiments on mammalian lungs, kidneys, liver, gastric mucosa, and muscle; also on yeast, yeast maceration juice, and germinating plant cells. Support was given to Meyerhof's theory of the identity of the co-enzymes of respiration and fermentation, by the observation that when boiled muscle or yeast juice was added to muscle which had been inactivated by washing, the reducing power was restored. Under anaerobic conditions muscle reduced more promptly, indicating that the nitro-body acts as a true hydrogen acceptor in the respiratory process. For estimating the intensity of respiration — *e. g.*, in different species of animals — the amounts of nitrophenylhydroxylamine formed were estimated spectroscopically by finding the time taken to form met-Hb when the filtrates were treated with Hb. In the formation of the toxic nitrophenylhydroxylamines we have an example of an individual factor in toxic action; a second is the detoxification by conversion to nitranilines; while a third factor is the sensitiveness of various tissues to the drug, in the present case the blood being most sensitive." — Reid Hunt.

TRANSFUSION IN NITROBENZENE POISONING. *S. Hindse-Nielsen.* Abstracted as follows from Ugeskrift for Laeger, Sept. 9, 1920, 82, No. 37, 1157, in Jour. Am. Med. Assn., Nov. 27, 1920, 75, No. 22, 1530. — "The artificial oil of bitter almonds, or nitrobenzene, is occasionally taken, or used by mistake for benzaldehyd, but the resulting symptoms are liable to be mistaken for potassium cyanid poisoning. The odor of the breath is the same, but with the latter the complexion is natural while with nitrobenzene poisoning there is intense cyanosis. Early differentiation is important, as transfusion of blood may prove life saving, with nitrobenzene poisoning, as in a case described, while this would be irrational with the other, as the blood is ready to give up its oxygen but the tissues have lost the capacity of taking it up. The stomach must be freely rinsed out with nitrobenzene poisoning, concluding by pouring through the tube 0.5 gm. of calomel, or better yet, a saline purge, as this would prevent absorption. Castor oil, oil, milk, and alcohol must not be allowed, as they help to dissolve the poison further. A warm bath with a cold douche proved extremely beneficial in three cases. Nitrobenzene destroys the erythrocytes, transforms the oxyhemoglobin into methemoglobin, irritates and then paralyzes the central nervous system, and has a dilating effect on the heart." — K. R. Drinker.

METHYL BROMIDE POISONING—A CONTRIBUTION TO THE STUDY OF THE DELAYED ACTION OF POISONS. *Fritz Rohrer.* Vrtljschr. f. gerichtl. Med., July, 1920, Third Series, 60, No. 1, 51–59. — Rohrer reports a case of acute poisoning from fumes of methyl bromide which gave a very characteristic clinical picture. A foreman in a chemical factory was brought to the hospital unconscious, with deep inspirations, foam on the lips, pupils widely dilated. Convulsive attacks, affecting especially the muscles of the arms and of the jaws, succeeded each other with constantly shorter intervals until the condition became continuous. The blood flowed readily, was blackish in color, coagulated normally. The differential count gave 40 per cent. mononuclears. There was no abnormality of the red cells. Urine showed albumin, no sugar, acetone, or acetic acid.

The history showed that on the previous day he had twice done some repair work on the methyl bromide apparatus. Nothing unusual was noticed in his condition that day except that he was unusually silent and weary at night. Three o'clock the following afternoon, he was suddenly taken with violent jerking of the left arm; he soon lost consciousness and epileptiform attacks came on at short intervals up to his death within about an hour of the onset of the attack. No bromine or bromine compounds were found in organs or fluids.

Rohrer reviews eight cases in the literature, in four of which there was a history of severe muscular jerkings. A remarkable feature of the poisoning is the long latency of a compound which is rapidly absorbed and which disappears so quickly from organs and fluids that it has never been detected at autopsy. The damage to the central nervous system is profound and more or less permanent. Whether this disturbance takes place primarily in the cells of the central nervous system, or in the ductless glands, causing functional changes in the nervous system, cannot as yet be said. It is even possible that there may be a general disturbance of metabolism resulting in an accumulation of products capable of causing this catastrophic

effect on the central nervous system. The sudden explosion of symptoms reminds one of a fatal anaphylactic shock. — A. Hamilton.

Poisoning with Methyl Bromide and Demonstration of the Substance in the Blood and Organs of Poisoned Animals. *W. Löffler* and *W. Rütimeyer*. Vrtljschr. f. gerichtl. Med., July, 1920, Third Series, 60, No. 1, 60–67. — Methyl bromide is produced in the chemical industry to be used for the preparation of methyl compounds for aniline dyes and of antipyrin. Ten cases of poisoning by methyl bromide have been reported in the literature since 1899, and the authors add another. This was a case of sub-acute poisoning, the patient having complained of discomfort whenever he was employed indoors in the methyl bromide department, but declaring himself perfectly well when he was shifted to out-of-door work. One day during his second period of employment with methyl bromide, he was exposed to fumes in perceptible amount but did not complain, and went on working. Three days later, he was again exposed, this time to a larger amount. The accident occurred in the morning and it was not until he was preparing to leave at the end of the day that he was suddenly taken with dizziness, violent trembling of the whole body, and loss of consciousness. He was seized with clonic and tonic convulsions every five or ten minutes, with jaws locked, hands clenched, opisthotonus, pupils wide, no corneal reflex. These attacks lasted two minutes; then there was sudden relaxation but no return to consciousness. There was bloody foam on the lips, no involuntary evacuations, no peculiar odor on clothes or breath. At the onset the pulse was 54, three hours later, 130, small and weak. Urine examination was negative except for albumin. Blood count showed polymorphonuclear leucocytosis. No bromine nor bromine compounds could be found at autopsy. The authors exposed guinea pigs to fumes of methyl bromide and found that, if the animal lived for thirty to seventy minutes after removal from the fumes, it was difficult, if not impossible, to detect methyl bromide in the body; but if it was killed immediately after exposure, the substance could be demonstrated in fluids and organs. — A. Hamilton.

The Physiological Action of Fumes of Iodin. *A. B. Luckhardt, F. C. Koch, W. F. Schroeder* and *A. H. Weiland*. Jour. Pharmacol. and Exper. Therap., March, 1920, 15, No. 1, 1–21. Abstracted as follows in Am. Jour. Med. Sc., Oct., 1920, 160, No. 4, 607. — "Iodine deposited on the skin in the form of fumes is absorbed and appears in the urine of both man and dogs. In dogs the iodin content of the thyroid was found to be greatly increased, the increase being accompanied by a corresponding change in the histological features of the gland. The same was true when the iodin was inhaled. The inhalation of iodin fumes causes respiratory disturbances consequent on the irritant action of the fumes; large amounts lead to the death of the animal within twenty-four hours from acute and rapidly developing pulmonary edema. The edema supervenes more rapidly in animals having respiratory disease than in normal dogs. The authors believe that the fumes of iodin should never be inhaled for therapeutic purposes and in persons with pulmonary disease such administration is absolutely contraindicated." — K. R. Drinker.

Some Observations on a Case of Lead Poisoning. *H. A. Lubbers*. Nederl. Tijdschr. v. Geneesk., July 31, 1920, 64, Second Half, No. 5, 409–412. — The patient, a type-founder in Amsterdam, came to the writer complaining of vague gastric symptoms; oppression after meals, headache and disturbances of vision, which had troubled him for six months. Physical examination was negative, save for a light-colored line near the gingival margin, most marked in the neighborhood of the upper canines. The gums were in bad condition. The blood showed 90 per cent. hemoglobin, no basophiles, no abnormal corpuscles, no stippling. A test meal showed anacidity. The feces were negative for blood. After being sent home with a diagnosis of anacidity of unknown cause, the patient came back in a month with much aggravated symptoms, colic and a definite lead line on his teeth. The red blood corpuscles now showed definite stippling.

A week later the patient brought in some grayish powder that he had scraped from the side of his *pot de chambre*. Upon obtaining a specimen of urine, the author had it analyzed by Mr. Keulemans, who reported the presence of metallic lead. The feces were then examined, rubbed up with water, allowed to sediment and the supernatant fluid was poured off. The sediment from this showed metallic lead, which stained the pestle a lustrous black. Inner portions of scybala were examined with the same result.

The patient was then taken into the hospital and his feces collected. Out of the first dejection, weighing 175 gm., 60 gm. yielded 80 mgm. of metallic lead; 20 gm. when incinerated yielded 33 mgm. of the metal. Out of the entire mass, then, there were 234 mgm. of metallic and 289 mgm. of total lead. At this rate, the patient must have got rid of about 0.25 gm. of lead in the three weeks after he left his work. He was quite sane, had no enemies and the lead was combined with antimony and tin, proving that it came from the shop where he worked.

Investigation showed a well-ventilated establishment, with oiled "terrasso" floor. In the room where the patient was employed there were three casting machines and other type-making apparatus. The molten lead was kept in a furnace which was fed at intervals through a trap, which was kept closed except when opened to throw in more lead.

It was found that when the machines, which were operated by keys and therefore kept the hands of the operator from actual contact with the lead, were emptied of the lines of type which had been cast, that these lines of type were removed six at a time and the slots brushed out to make room for the new type. During this operation small particles of lead would fly into the air, littering the floor about the machine. Examination of the fingers of the operators showed a metallic coating on the skin. The man operating the machine usually worked by the patient was requested to send a stool to the hospital. This he did. It was examined and showed but two small flakes of lead in 45 gm. of stool. He was examined and found to be quite healthy and his blood normal. The finger-nails of three operators in the room were cleaned and the material obtained yielded 4, 3, and 11 mgm. respectively.

Although examination of the other workmen failed to show anything commensurate with what was discovered in the case of the patient, it would be well to investigate this matter further and to consider it as a form of occupational malady. — N. C. Foot.

LEAD IN URINE IN NEUROCIRCULATORY DISTURBANCES. *C. A. McDonald* and *H. McCusker*. Abstracted as follows from Boston Med. and Surg. Jour., Nov. 4, 1920, 183, No. 19, 543, in Jour. Am. Med. Assn., Nov. 20, 1920, 75, No. 21, 1450. — "Twelve cases representing nervous disorders of many types are recorded by McDonald and McCusker. Not one of them showed signs of lead poisoning, like the lead line, anemia, or stippling. It was only by making a routine urinary for lead in doubtful cases that the lead element was discovered. These cases are reported to stimulate corroboration or refutation of Chapman's standard, that 0.4 mg. of lead per liter of urine is sufficient to cause symptoms; and secondly, to argue for the consideration of lead as the etiologic factor, or one of the etiologic factors, in obscure cases presenting neurologic signs and symptoms." — K. R. Drinker.

METALLIC LEAD IN FECES. *N. Keulemans*. Abstracted as follows from Pharm. Weekblad, 1920, 57, 678–679, by J. F. Smith in Chem. Abstr., Sept. 20, 1920, 14, No. 18, 2825. — "In the case of a printer suffering from Pb poisoning, metallic Pb (in fine splinters) was found to the amount of 80 mg. in 60 g. of feces. The metal particles contained also Sn and Sb, corresponding to the composition of the type metal with which the patient worked. After a few days' absence from work, the feces contained no Pb." — W. O. Fenn.

DETERMINATION OF MERCURY IN THE URINE. *Autenrieth* and *Montigny*. Abstracted as follows from München. med. Wchnschr., Aug. 6, 1920, 67, No. 32, 928, in Jour. Am. Med. Assn., Nov. 27, 1920, 75, No. 22, 1528. — "Autenrieth and Montigny find that the quantitative determination of mercury in the urine by the colorimetric method is simple and sufficiently accurate for practical purposes. Owing to the manner in which mercury is employed, it is seldom excreted in the urine in other than very small quantities, so that the colorimetric method is especially appropriate. But this method is applicable only in case no other metal precipitated by hydrogen sulphid, such as lead, copper, silver, tin and bismuth, is present. It is just as accurate as the gravimetric method of Schumacher and Jung, and is not much inferior, if any, to the electrolytic method of Buchtala, and has the advantage of not requiring a delicate scale for its application such as is needed in the Buchtala method." — K. R. Drinker.

RAPID COLORIMETRIC METHODS FOR DETERMINATION OF PHOSPHORUS IN URINE AND BLOOD. *R. D. Bell* and *E. A. Doisy*. Jour. Biol. Chem., Oct., 1920, 44, No. 1, 55. Abstracted as follows in Jour. Am. Med. Assn., Nov. 13, 1920, 75, No. 20, 1373. — "Rapid

colorimetric methods are described by Bell and Doisy for the determination of inorganic and total phosphorus in urine. While not so accurate as suitable gravimetric determinations, these methods are said to be much more convenient and are sufficiently accurate for many purposes. The method for inorganic phosphate appears to be more accurate and rapid than the usual uranium titration. Methods are also described for the determination of inorganic and acid-soluble phosphorus in blood."—K. R. Drinker.

DUST HAZARDS AND THEIR EFFECTS

A Study of the Dust Hazard in the Wet and Dry Grinding Shops of an Ax Factory. *C.-E. A. Winslow* and *Leonard Greenburg.* U. S. Pub. Health Ser., Pub. Health Rep., Oct. 8, 1920, 35, No. 41, 2393–2401. — The authors conclude as follows:

"From these investigations it seems clear that the enormous incidence of tuberculosis among the grinders and polishers in this factory, indicated by Dr. Drury's study, is by no means surprising and that it is due primarily to the hazards of wet grinding.

"No dust determinations were made in the polishing shops, on account of the lack of suitable electrical connections for operating the dust-sampling apparatus. The polishing wheels were, however, equipped with an excellent exhaust system. In the case of the dry-grinding shop, which would naturally be much more dusty than a polishing shop, a similar exhaust system proved eminently satisfactory as a preventive of dust dissemination, the air showing an average of only 154,500 one-fourth standard-unit particles per cubic foot. In the wet-grinding shops, on the other hand, only 1 sample out of 32 showed less than 1,000,000 such particles, and only 12 less than 10,000,000, the general average being 15,800,000 one-fourth standard-unit particles per cubic foot. This is one of the highest values ever recorded in any industrial establishment.

"It seems evident that the protection afforded by wet grinding, as compared with dry grinding, is in this instance illusory. In order to facilitate rapid work the operators are tempted to cut down the amount of water supplied to the wheel; and in grinding a heavy object like an ax upon a wheel of soft natural sandstone the worker presses so heavily upon the wheel that the superficial film of water is pushed back behind the ax and the outer surface of moist stone is ground off, exposing a dry surface, which in its turn is abraded and discharged as atmospheric dust. The danger is increased by the fact that rapidly revolving wet wheels must be rotated upward toward the face of the worker. The principle of using moisture to eliminate industrial dust is no doubt a sound one, as exemplified in the measures taken for the protection of the miners in South Africa by the use of sprays. The present study merely emphasizes the fact that the efficacy of a process of this sort must be checked up by laboratory tests in order to determine its real effectiveness.

"It is evident that wet grinding on sandstone wheels, as practiced at the ax factory studied, is an exceedingly hazardous process, and that the substitution of dry grinding with an efficient exhaust system (or possibly the use of wet grinding on artificial abrasive wheels of a harder nature) is clearly indicated as a measure for the protection of the workers against respiratory disease." — M. C. Shorley.

Silica as a Cause of Printers' Phthisis. London Letter, Oct. 16, 1920. Jour. Am. Med. Assn., Nov. 6, 1920, 75, No. 19, 1280. — "In a letter to the *Times*, Mr. E. Halford Ross brings forward a new theory as to the causation of printers' phthisis. Early in 1918 he reported to the health committee of the joint industrial council of the printing trades that there was a concentration of hereditary predisposition to consumption in compositors owing to the 'closeness' of their craft and to intermarriage within their families. About a year ago his suspicions fell on printers' list as a cause. It is a black, grumous, woolly, fluffy substance that collects in compositors' boxes, trays, cases and chases. It had already been examined by bacteriologists for the tubercle bacillus but found to be sterile. This was a peculiar fact and encouraged Mr. Ross to make a further examination. He then found that the list does not readily decompose like the dirt collected in rulers', readers' and binders' rooms, which soon becomes musty and smells. Then he remarked its weight and realized that there was no object

in looking for the tubercle bacillus in it, for the bacillus was already latent in the human subject. A chemical analysis was carried out. Samples of list were obtaincd from various works and sent unlabeled to chemists. They reported that the list from composing rooms contained both silica and iron in appreciable quantities; the list from machine rooms contained less. It is known that silica and the oxids of iron light up phthisis when inhaled continually by those predisposed to the disease. The condition of the lung produced by silica, which predisposes to phthisis, has been described as silicosis. One of the great printing firms of London has for some time used suction bellows on compositors' trays, cases and chases to remove the list." — K. R. Drinker.

THE CAUSATION OF PRINTERS' PHTHISIS. London Letter, Oct. 23, 1920. Jour. Am. Med. Assn., Nov. 20, 1920, 75, No. 21, 1438. — "The hypothesis of Mr. E. H. Ross that the silica and iron contained in printers' list is the cause of the prevalence of phthisis among printers is challenged in a letter to the *Times* by Professor Leonard Hill the physiologist, one of the Medical Research Council appointed to inquire into industrial tuberculosis. He points out that silica and iron are found in almost any common dust, and he considers that silica dust is harmful only when inhaled for a long period and in concentrated doses, as by the workers in flint, ganister, granite and quartz. The evidence also goes to show that large amounts of silica dust can be inhaled with impunity when mixed with coal or other dust of 'edible' nature. Coal dust stimulates the cells of the air passages to clean up the lungs by phagocytic action. Pure silica particles, on the other hand, seem to have no such stimulating action and, collecting in the lung tissue, excite there a fibroid change, which finally ends in tuberculous infection. Mr. Hill points out that tuberculosis attacks the operative printers' assistants more severely than the compositors, and they do not handle the boxes of type. The air of printing shops is not particularly dusty, and it seems improbable that the inhalation of silica dust in such shops has anything to do with tuberculosis. The users of public roads, paved with granite or flint, in dry weather inhale clouds of silica dust stirred up by motorcars, but the exposure of road sweepers to the dust does not appear to produce silicosis of the lungs. What is required is daily exposure in such dusty, enclosed spaces as those in which the gritstone worker, mason, or tin and gold worker are confined. Printers' work takes place in warm atmospheres, and in sunless, artificially lighted places — conditions which lower the metabolism and vitality of the body, and predispose to phthisis." — K. R. Drinker.

SMOKE REMOVAL AT ZINC OVENS. *A. Roitzheim.* Zentralbl. f. Gewerbehyg., Oct., 1920, 8, No. 10, 185–188. — One of the most difficult tasks in industrial smoke elimination is that of smoke from the condensation vessels of zinc ovens. The smoke arises from all parts of the oven and is very finely divided zinc oxide, formed by the uncondensed zinc vapors oxidizing in the air to the white oxide.

In the Rheinisch zinc smelters a wedge-like cap is used on the chimneys but this is only partially effective, while exhausts and artificial blowers work well only in connection with machines.

In one of the zinc ovens of the Oberspree-Berlin Oberschöneweide Zinc Refinery, Roitzheim devised a new method. The front of the zinc ovens were completely cut off from the outside by double-wing cast iron doors. For observation and working, holes 50 mm. wide are drilled. When closed the wings of the doors form a closed chamber, which, except for cracks, joints, and the observation holes, shuts off the ovens completely. The molten zinc in the ovens can be drawn off without opening the chamber, which in turn is connected with a 50-m. chimney. The draught loss is negligible and cold air is prevented from undercooling the zinc.

The zinc oxide mixture is led off through a system of canals with sharp turns so that in these corners the majority of the escaping zinc smoke collects.

That the method is successful is borne out by its long satisfactory use in a large factory in a thickly settled Berlin suburb. — H. V. Williams.

THE MENACE OF SOME FACTORY DUSTS. *David J. Price.* Abstracted from Tea and Coffee Trade Jour., 1920, 39, pp. 166–170, by Charles E. Munroe in Chem. Abstr., Oct. 10, 1920, 14, No. 19, 2988. — "A description, with photographs, is given of recent explosions from spice, sugar, cocoa, and cork dusts. — W. O. Fenn.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

IMMUNITY TO TUBERCULOSIS AMONG WORKERS IN SULPHUR DIOXIDE. *F. Tweddell.* Med. Rec., Aug. 21, 1920, 98, No. 8, 310–312. — "Having used sulphur dioxide with good results in the treatment of pulmonary and laryngeal tuberculosis for the past four years, I thought it might be of interest to know if men who were exposed to this gas in industries where it is used were benefited or harmed thereby." A circular was answered by thirty-eight companies, thirty-one of which testified that they had never had a case of tuberculosis among their men. The twenty-nine companies who gave adequate returns employed a total of 11,085 men, of whom 7,707 were habitually exposed to sulphur dioxide or sulphuric acid. Fourteen companies reported being in existence for periods the average of which was over twelve years. Only twenty-two cases of tuberculosis were noted during the entire period of the existence of all these firms. When from these cases there are eliminated cases which could not have been produced during the term of service, etc., very few are left. The replies to the circular seemed to corroborate the opinion that men working exposed to the chemicals under consideration were unusually free from pulmonary and throat diseases, including influenza and common colds. — G. E. Partridge.

TEA TASTER'S COUGH. U. S. Nav. Med. Bull., Oct., 1920, 14, No. 4, 669–670. — "Dr. A. Castellani in a recent address on the relation of the higher fungi to human pathology, delivered before the Royal College of Physicians, London, gave an interesting account of a case of chronic bronchitis in an assistant in one of the big Ceylon tea firms. A number of medical men had diagnosed tuberculosis, but the patient informed the author that he merely had 'tea taster's cough.' Dr. Castellani admits that he never heard of such a malady before. Physical examination revealed nothing but a few coarse râles in the chest, and the sputum was negative for bacillus tuberculosis. It contained, however, some mycelial filaments and yeastlike bodies.

"Tea tasters not only taste infusions, but often fill their hands with tea leaves and bury their noses in them and snuff them up. A certain amount of dust is thus inhaled. The tea dust of Ceylon constantly contains fungi of the genus *Monilia*, frequently contains those of *Aspergillus* and *Penicillium*, and sometimes fungi of *Oïdium* genera. A peculiar streptococcus also occurs. These organisms are not rarely found in the nasal cavities of tea tasters and in the bronchial secretions when they have a cough.

"Somewhat similar affirmation may be made about workers in tea factories. When these workers develop a cough, lose weight and strength from inhalation of dust, they must leave the factory and go to the country, when the symptoms gradually disappear." — C. C. Lund.

THE SAPROPHYTIC GROWTH OF ANTHRAX ON ANIMAL HAIR. *Victor Gegenbauer.* Arch. f. Hyg., 1920, 89, No. 5, 202–222. — Anthrax will grow on hair at 20° C. in the presence of hygroscopic moisture. Inoculations on hairy animals show a spread of the growth over areas 10 to 100 times greater than the area inoculated.

Anthrax has often been recovered from skins which appear to be perfectly normal and the author believes that the infected skin or hair of normal healthy animals may play a considerable rôle in the spread of anthrax. Animal hair may become infected by contamination from the discharges of sick animals or from dust or water or fodder which has been so infected. — H. F. Smyth.

METHOD FOR SECURING MORE RESISTANT ANTHRAX SPORES. *Rupert Reiter.* Arch. f. Hyg., 1920, 89, No. 5, 191–201. — Different strains of anthrax vary in their resistance to heat; strains of high resistance should, therefore, be used as test material.

Heider's wheat-extract-agar is the best culture medium for developing anthrax spores of maximum heat resistance, as it always develops more resistant spores than does any other medium suggested.

Subcultures to test the action of disinfectants, etc., on anthrax spores should be made in dextrose-serum-bouillon (3 per cent. dextrose, 5 per cent. serum) as spores will vegetate in this medium when they refuse to do so in ordinary bouillon. — H. F. Smyth.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

Cutaneous Lesions from the Use of Artificial Fertilizers. *Giuseppe Pavia.* Il Lavoro, Sept. 30, 1920, 12, No. 5, 131–134. — The use of calcium cyanamide has recently been introduced in Italy as a nitrogenous fertilizer. It is extremely dusty and light, and easily works through the clothing. When the peasant scatters it by hand it forms a cloud in the air and falls on his sweating skin. Very severe lesions are produced on the mucous membranes of the nose and throat and on the skin, especially of the forearms. Another irritating fertilizer is calcium nitrate. The author describes a patient who suffered severely with burning pains on the forearms and knees. Vesicles formed, and then ulcers, which were very slow to heal, and when seen at the end of twenty days, it was necessary to send him to a hospital for treatment. According to popular belief, blonds are very much more sensitive to both compounds than are brunettes. Lesions of calcium cyanamide usually take from twenty-five to forty days to heal. — A. Hamilton.

The Professional Stigmata of Ice-Cream Makers. *Luigi Ferrannini.* Il Lavoro, Aug. 31, 1920, 12, No. 4, 97–101. — This is an illustrated article dealing with the callosities which form on the hands of ice-cream makers in Italy where apparently the turning of the ice cream is all done by hand. The work is said to be carried on continuously from three to fifteen hours out of the twenty-four, and the apprenticeship for this work begins at the early age of ten years. — A. Hamilton.

Perforating Wounds of the Eye: An Investigation of 106 Cases Occurring in Soldiers at a Military Center in London. *G. Maxted.* Abstracted as follows from Brit. Jour. Ophth., 1920, 4, p. 12, by T. D. Allen in Internat. Abstr. Surg., May, 1920, 30, No. 5, 406. — "This paper reports the results of 106 eye wounds not necessitating immediate enucleation. The nature of the accident, the seat of perforation, the injury to the lens, the prolapse of the iris, sympathetic ophthalmia, and vision are all considered.

"There was only one case of sympathetic ophthalmia in the series although there were 37 wounds in the danger zone and 46 cases of foreign bodies in the eye. In 24 of the 46 cases the body had been extracted early with a magnet before the patient was seen by the author. The eye was enucleated in 9 of the remaining 22 cases. One patient died following another operation; 9 left the hospital with the foreign body still in the eye but had light perception. The remaining 3 had vision of 3/60, 6/36, and 6/9 at the time of the report." — K. R. Drinker.

Eye Injuries. *Frank C. Trebilcock.* Proc. 6th Ann. Meeting Internat. Assn. Indust. Accident Boards and Commissions, U. S. Bur. Labor Statis., Bull. No. 273, Aug., 1920, 261–266. — Careful examination is often necessary to detect attempted fraud on the part of persons with mild eye injuries. Two cases are described. Traumatic cataracts are now more or less readily removable surgically, but removal is not always desirous except from the cosmetic point of view. Unintelligent persons with traumatic cataract are best left alone, but intelligent patients should be given the right of choice as to surgical removal. — Barnett Cohen.

The Effect of Concentrated Alkalies and Acids on the Eye. *A. Sigrist.* Abstracted as follows from Ztschr. f. Aughlk., 1920, 43, p. 176, in Therap. Halbmonatsh., Sept. 1, 1920, 34, No. 17, 489. — "The observation of a severe accident to the eye with cloudiness of the cornea and iridocyclitis caused by hot caustic soda solution induced the author to reopen the question as to the action of concentrated alkalies and acids on the eyes of rabbits. Experiment and clinical observations show that alkalies when they reach, even in small doses, the conjunctival sac are capable of diffusion through the cornea and may lead to severe injury of iris and ciliary body. The only way of preventing such an effect is to wash out the eye thoroughly within five minutes of the entrance of the alkali. Therefore in practice a harmful result can hardly be prevented. Ammonia can be demonstrated in the anterior chamber within five seconds after introduction, and puncturing the anterior chamber lessens the danger of damage to the interior of the eye. The effect of acids is more superficial, a thick crust forming at once and preventing the further penetration of the acid." — A. Hamilton.

Secondary Inflammation of the Eye after Hydrogen Sulphide Poisoning. *Hoppe.* Abstracted as follows from Ztschr. f. Aughlk., 1919, 43, p. 195, in Therap. Halbmonatsh., Sept. 1, 1920, 34, No. 17, 490. — "Employees in a sulphur factory in which hydrogen sulphide is formed as an intermediate product are attacked from time to time by an extremely painful inflammation of the eyes with swelling of the lids, photophobia, and hyperemia of the conjunctiva. It is characteristic that these symptoms come on as a usual thing some hours after the workmen have left the atmosphere of hydrogen sulphide fumes and that there is no other disturbance of health. The warning signs consist in the appearance of a colored ring around the light and an increased sensitiveness to all kinds of illumination. The extreme photophobia is probably caused by an affection of the corneal epithelium. Since hydrogen sulphide does not possess any real caustic action, Hoppe is inclined to believe that the irritation is an indirect effect following a previous inhalation of some poison so far not isolated. Even if this part of the subject is not yet clearly understood, Hoppe advises that the workmen should be protected against the poisonous fumes by appropriate gas masks." — A. Hamilton.

Amblyopia from Carbon Disulphide. *Terrien.* Abstracted from Paris Médical in Il Lavoro, Sept. 30, 1920, 12, No. 5, 147. — Terrien reports two cases of central scotoma with notable reduction of the visual field in two persons who had been exposed to the vapors of carbon disulphide, throughout an eight-hour day, while spreading a solution of rubber in benzine and carbon sulphide on paper in order to make mustard plasters. A retrobulbar neuritis was found similar to that caused by nicotine and by alcohol. — A. Hamilton.

Recognizing Eyesight as an Industrial Asset. Nat. Assn. Corporation Training Bull., Nov., 1920, 7, No. 11, 496. — From the point of view of efficiency and safety, few factors in industry are of greater importance than the integrity of the eyesight of the workers. Yet systematic examination of the eyes of employees is a very recent welfare measure. Great advances have been made in the direction of proper lighting of buildings, etc., but this is only a part of the requirements. These provisions have reference mainly to general conditions and normal eyesight, whereas the percentage of defective eyes among workers is very high, and consequently in many cases the general provisions must be supplemented by attention to the individual. At the present time there is a wide range of service rendered to workers, including preliminary examinations in connection with medical tests, advice as to treatment, attention to emergencies, free hospital service, and the services of expert oculists. — G. E. Partridge.

Ears and the Job. *Estelle E. Samuelson.* Laryngoscope, Aug., 1920, 30, No. 8, 501–504. — This paper discusses the work of the New York League for the Hard of Hearing in securing employment for deaf persons. According to the author, a deaf person is an asset in a business office because he concentrates better than others; he is more efficient at general routine because he is accustomed to monotony and isolation; he does more work in less time than a hearing person because he does not engage in the chatter going on about him; he recognizes his limitations and does not seek constant change; he is a master of detail. — K. R. Drinker.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

Reorganization for Prevention of Accidents in Industry. *Hans Hederich.* Zentralbl. f. Gewerbehyg., Sept., 1920, 8, No. 9, 179–182. — Article 161 of the new constitution declares that maintenance of health and of the ability to work is the chief aim of social insurance. Under the new régime the executive organs for the prevention of accidents are the various technical inspectors of the individual industrial companies. These, whose business it is to set rules for accident prevention, ought to be academically trained, and should have many years of practical experience.

As a guide for the simplification of the process and for a consolidation of the costly work, the author proposes some thirteen rules. He suggests the appointment of common technical inspectors for all trades with the same or similar machines and processes. Those industries with little element of danger should be grouped with similar industries where the danger factor is great. The inspector should have

powers not subordinate to, but rather co-ordinate with those of the business agent, and full independence of action should be granted him. Penalties upon workers and contractors for infractions of the regulations, as well as prohibition to work on machines which are unprotected, or where the safety device is impaired, are prescribed. Other suggestions are a central bureau for exhibition of safety devices, the placing, so far as is possible, of the dangerous parts in the interior or less readily accessible portions of the machine, appointment of workers as aids to the technical inspectors, extension of social insurance to clearly demonstrable industrial diseases, and the immediate investigation of large scale accidents by official inspectors. — H. V. Williams.

Safety. *H. J. Wilson.* Great Britain, Ann. Rep. Chief Inspect. Factories and Workshops for 1919, pp. 12–32. — As a preliminary to accident prevention it has been found essential to have a careful analysis made of all accidents occurring in a particular industry and so classified as to bring into prominence not only the machines which cause the majority of casualties but the respective parts of these machines.

Attention is drawn to the number of accidents which result from some defect in plant or error in design of machines. There are, however, a large number of accidents preventable through the training and education of the worker. Experience has shown that a reduction of accidents can be secured by the interest and co-operation of operatives and officials through the agency of the safety committees.

Works committees dealing with a wide variety of subjects affecting the general welfare of the workers have succeeded in exerting an excellent influence in abolishing friction between management and operatives.

This article deals extensively with the accidents to specific types of machinery, such as transmission machinery, cranes, hoists, power presses, baker's machinery, grindstones, laundries, steam boilers, etc. Fires and explosions are also discussed. — L. A. Shaw.

Dangerous Trades. *G. Stevenson Taylor.* Great Britain, Ann. Rep. Chief Inspect. Factories and Workshops for 1919, pp. 33–43. — The observance of the Special Rules and Regulations for dangerous trades is still below the pre-war standard. This seems to be due to the fact that repairs have not yet caught up with the general wear and tear on the plants which were occasioned by war-time production. Few deliberate evasions have been noted.

The reports from the inspectors respecting the status of each occupation which is governed by safety rules are herewith presented. The following occupations are thus included in the reports: file cutting by hand; electric accumulators; docks; self-acting mules; wool sorting and combing and East Indian wool; locomotives; horsehair; casting of brass; vitreous enamelling; nitro and amido derivatives of benzene; tinning of metal holloware; grinding of metals and racing of grindstones; lead smelting; bronzing; pottery; shipbuilding; refractory materials; hides and skins; vulcanising of India rubber by means of bisulphide of carbon; chemical works; aerated water bottling; and tar distilling. — L. A. Shaw.

Explosions from Pressure Valves of Oxygen Tanks. *H. J. Scholte.* Zentralbl f. Gewerbehyg., Oct., 1920, 8, No. 10, 196. — To the eight rules of Gärttner-Stuttgart for prevention of explosions from the pressure reducing valves of oxygen tanks, the author would add a single observation which he deems most important. The author believes that in many cases the heat of compression causes a burning of the hard rubber packing. The flame then spreads and burns vigorously in the highly compressed oxygen, heating the iron and steel and melting the brass. A table of heats of compression is appended.

The author's principle of explosion prevention is to give the hot compressed air opportunity for escape. This is to be accomplished by leaving the cock of the outlet valve wholly open, opening the reducing valve a little and turning in a bit the lever screw on the valve. Although some oxygen is lost, the author believes that the added factor of safety more than compensates.

An apparatus constructed with downward directed exhaust is also suggested. — H. V. Williams.

Two New Protective Devices from the Amsterdam Safety Museum. *H. J. Scholte.* Zentralbl. f. Gewerbehyg., Oct., 1920, 8, No. 10, 195. — From the Amsterdam Museum of Safety, the first institution to exhibit safety appliances on machines instead of on models, there come two new devices. One is for shafts

with internal threads on lathes and polishing machines, where the conical worm bolt is screwed onto instead of into the axle end. In this way the outside thread of the axle is used.

Filarski has found a solution for the supplemental operation of bolts with internal threads. A pin is driven centrally into the axle end with the inside thread, so that the hole is filled in such a manner that not even the smallest finger can enter. A hole one or two millimeters larger is bored into the thread bolt and the device is complete. — H. V. Williams.

INDUSTRIAL SURGERY

Industrial Injuries and First Aid. A Plea for the Immediate Treatment of the Injured. *A. C. Burnham.* Med. Rec., Aug. 21, 1920, 98, No. 8, 307–310. — Recent estimates and statistics show two important facts: a shortage of about 6,000,000 workers in the United States, and a high accident rate. In 1918 there was a total of 184,844 accidents, of which 3403 were fatal. Tables showing the nature of the injuries and their distribution in occupations reveal the fact that approximately a third of the accidents are attributed to the metal and metal-products trades; and that crushes and bruises, cuts and lacerations make up more than 120,000 of the total of about 180,000 accidents.

The function of the medical profession in this situation is plain. Indirectly it becomes a producer by conserving the human factor, and its especial function is necessarily the care of the injury after it has occurred. It is at this point that various practical problems appear, some of the most important of them arising from the generally recognized fact that the earlier an injury receives intelligent attention, the better are the chances of recovery and the shorter is the period of disability. From this viewpoint arises the question of the value of voluntary aid and of the advisability of training first-aid assistants in factories, mines, schools and the like. There are at present conflicting views among physicians on these points, but at least some first-aid measures applied by a non-medical attendant appear to be allowable. Among these comes, first, the application of iodine to wounds, now well understood and amply justified by experience as one of the best methods of early treatment. In the case of burns the treatment is less clearly indicated, so far as first aid is concerned. Some use carron oil, but probably equally good results are obtained from boric acid ointment or even sterile petrolatum, although some prefer picric acid either in weak solutions or in the form of picric acid gauze. When the surgeon can be reached in a few minutes it is perhaps better not to have any dressing at all applied by the volunteer first-aid assistant. The use of the tourniquet by first-aid workers must be carefully supervised, for too often it is applied so that only the venous blood is blocked, thus increasing the bleeding rather than diminishing it. First aid in fractures should be limited largely to measures for the prevention of further injury, such as simple splinting. — G. E. Partridge.

Infections of the Upper Extremities. *P. A. Bendixen.* Proc. 6th Ann. Meeting Internat. Assn. Indust. Accident Boards and Commissions, U. S. Bur. Labor Statis., Bull. No. 273, Aug., 1920, 229–237. — The infected upper extremity does not get the painstaking intelligent treatment that its economic value demands. The cause is usually an external trauma breaking the continuity of the skin and permitting the entrance and multiplication of pathogenic organisms. It is claimed that the indiscriminate use of hydrogen peroxide by laymen is bad. The author classifies the various infections according to their anatomical location. Diagnosis and prognosis are discussed and it is emphasized that intelligent treatment can eliminate a good deal of the grave sequelae usually occurring. No matter how slight the accident it should be reported and proper treatment given. — Barnett Cohen.

Fracture of the Tip of the Distal Phalanx. Report of Twenty-Seven Cases. *Russell F. Maddren.* Jour. Am. Med. Assn., Oct. 30, 1920, 75, No. 18, 1198–1200. — The author reports upon twenty-seven cases and has had uniformly excellent results when surgical intervention was prompt. "All the cases occurred in adult male factory workers, and an average of only 6.3 days apiece was lost from work." Immediately upon diagnosis an incision into the closed connective tissue sac containing the pulp of the finger tip should be made. "If the pressure is relieved promptly

and without procrastination, its sequelae — pain and delayed sepsis — will not supervene." Local anesthesia can be employed and the site and the extent of the incision or incisions varied in accordance with the needs of individual cases.

The author's conclusions are as follows:

"1. Fracture of the tip of the distal phalanx is not a trivial injury.

"2. Early recourse to surgery, rather than expectant treatment, is indicated.

"3. The results of prompt surgical treatment in a series of twenty-seven consecutive and unselected cases have been uniformly excellent." — C. K. Drinker.

Foot Abnormalities and their Management in the Light of Army Experience. *T. S. Mebane.* Mil. Surgeon, Oct., 1920, 47, No. 4, 428–435. — The author concludes with the following summary:

"1. A foot may be considered normal when there is unrestricted joint motion and the line of weight bearing passes through the fore foot.

"2. Foot trouble can be prevented by wearing proper shoes, by correcting faulty attitudes, by care to prevent overtaxing, by eliminating focal infections and by the use of exercises to strengthen the foot muscles.

"3. Symptoms referred to the feet are encountered in many conditions.

"4. The cure of static foot defects is dependent upon muscle training. Mechanical correction by plates or shoe alterations is to be regarded only as an aid to treatment." — K. R. Drinker.

Acid Burns on Hands of Solderers. *Harry W. Keatley.* U. S. Pub. Health Ser., Pub. Health Rep., Sept. 10, 1920, 35, No. 37, 2161–2163. — This is a brief discussion of the experience of the Curtis Bay General Ordnance Depot in reducing acid burns. It was found that the men soldering air-tight containers for shells received a considerable number of acid burns from the soldering flux which they used. It was at first suggested that they wash their hands frequently in a solution of bicarbonate of soda. Later experiment however showed that by reducing the flux to one-half strength the work could be done just as satisfactorily with a 50 per cent. saving in cost of acid and the elimination of the acid burns. — C. H. Paull.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

The Chlorides of the Blood and of the Muscles in Fatigue. *Amati.* Il Lavoro, Sept. 30, 1920, 12, No. 5, 159. — Amati read a paper before the Royal Academy of the Medical Sciences in Palermo, February, 1920, in which he showed that the quantity of chlorides in the blood is constantly augmented by fatigue, and that the same thing is true of the chlorides in the muscles. The increase in the muscles is attributable to the greater volume of blood present in the muscles, for it is not found in muscles that have been bled white. — A. Hamilton.

Some Phases of Protein Catabolism and Fatigue. *E. L. Scott* and *A. B. Hastings.* U. S. Pub. Health Ser., Pub. Health Rep., Oct. 15, 1920, 35, No. 42, 2445–2462. — This article is summarized as follows:

"1. The concentration of total and neutral sulphur, total, ethereal, and inorganic sulphates, total and combined phenols, and total nitrogen in the morning and afternoon urines of a number of resting individuals and individuals subjected to work of varying degrees of arduousness has been determined.

"2. A tendency for a greater excretion of total sulphur per gram of nitrogen at night than in the morning has been noted in both groups of men. The greater part of this increase has been attributed to the sulphur of the food ingested. There seems, however, to be a somewhat greater output in men subjected to the more severe operations.

"3. There is practically no increase in the output of sulphate sulphur per gram of nitrogen during the day in men in bed, whereas there is an undoubted increase in men subjected to labor. This increase is larger the more severe the labor.

"4. There is a tendency for the proportion of total sulphur (which is eliminated as sulphate) to increase during a day of exercise; and this tendency is much more marked the more severe the exercise.

"5. The severity or arduousness of any particular form of labor may be judged by the ratio of the morning to the afternoon sulphate of the urine, providing a sufficient number of determinations have been made upon several individuals.

"6. Our experimental results apparently indicate that the ability of the human organism to conjugate the phenol bodies is unchanged by moderate muscular effort.

"7. Directing our attention to the absolute excretion of unconjugated phenols, we find that this quantity is increased slightly by moderate work and greatly by strenuous exercise. This suggests that the free phenol excretion may be a factor in severe fatigue.

"8. Theoretical considerations indicate that the average worker excretes more indol and allied substances, particularly as sulphates, than men with whom care is taken to maintain regularity of habits and a wise selection of food.

"9. Because of the greater dependence of the phenol production and excretion upon the peculiarities of habit and diet of men than upon their muscular activity, no progressive change in quantities or proportion of phenol excretion could be correlated with increasing arduousness of occupation, except in the instance of strenuous exercise.

"10. It is thought that simultaneous analytical studies must be made of the phenol and indol groups and the substances with which they are conjugated, notably sulphuric and glucuronic acids, before a positive statement of their relation to fatigue is justified." — M. C. Shorley.

Should the Eight-Hour Day be Continuous or Interrupted? *Pieraccini.* Abstracted from Nuovo Giornale in Il Lavoro, Aug. 31, 1920, 12, No. 4, 107–111. — To the question whether, from the hygienic point of view, the newly introduced eight-hour day should be interrupted by a short or a long lunch period, Pieraccini speaks strongly in favor of a long interval between morning and afternoon work. He believes that a lunch period of only half an hour, during which the workman has time for only a cold lunch, will result in serious disturbances of digestion, of nutrition, and of the nervous system. An hour and a half at noon is necessary if the factory is far from the workman's home, unless there is a restaurant in the factory itself. In any case, however, rest is necessary, and he therefore believes that an interval of two hours should be allowed. He suggests a summer schedule of four and a half or five hours' work in the morning, two hours' rest, and three hours and a half or three hours in the afternoon, while in winter the hours could be equally divided. — A. Hamilton.

INDUSTRIAL SANITATION: FACTORY CONSTRUCTION, ILLUMINATION, VENTILATION, HEATING, WATER SUPPLY, SEWAGE DISPOSAL

Modern Industrial Lighting for Oregon. *F. H. Murphy.* Electrical World, Oct. 23, 1920, 76, No. 17, 820–823. — A discussion of the new industrial lighting code of Oregon and its relation to the recommendations of the Illuminating Engineering Society and other state lighting codes. The minimum lighting requirements for various classes and parts of shops are practically the same as those adopted by Wisconsin. Special emphasis has been placed upon the elimination of glare. — G. M. Fair.

Illumination of Machine Tools. *G. Wagschal.* Electrical World, Nov. 6, 1920, 76, No. 19, 925–926. — A description of the lighting equipment and illumination intensities in the Central Gear Company of Detroit. The average intensity is 15.35 foot-candles over machines and 10.85 foot-candles over aisles, corresponding to an energy consumption of 1.6 watts per square foot, exceeding therefore by 60 per cent. the old empirical rule of 1 watt per square foot. — G. M. Fair.

ABSTRACT OF THE LITERATURE
OF
INDUSTRIAL HYGIENE

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INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

INDUSTRIAL MEDICINE: ITS PROPER RELATION TO INDUSTRY. *S. Dana Hubbard.* New York Med. Jour., Aug. 14, 1920, 112, No. 7, 212–214. — The writer reviews in very general terms the field of industrial medicine, indicating what he believes to be its functions and correct ideals. Employers are beginning to realize that the subject of health vitally concerns their industrial problems; medical and surgical supervision of work is essential in order to produce efficiently, since capacity depends probably more largely on the physical and mental condition of the workmen than on any one single factor. The first step in the conservation of energy and health is to learn the facts of the physical condition of the workmen; and since the value of medical service will be measured by its effect on production, the most useful industrial medical departments are those best able to prevent accidents and absence incident to illness. To obtain the best results, the medical supervision must extend to the care of the sick workmen at home, and to interest in domestic and community problems. In regard to detail, the duties of the medical profession in industry may be said to be very numerous, including both educational and preventive measures as well as actual medical and surgical treatment. — G. E. Partridge.

INDUSTRIAL MEDICINE AS RELATED TO EFFICIENCY. *John A. Turner.* Mod. Med., Oct., 1920, 2, No. 10, 668–671. — This is an article presenting a concise outline of the more generally approved practices concerning equipment, personnel and service relations of present-day industrial medicine. Housing and equipment of the health department is discussed. Important considerations in selection of personnel are suggested; and the functioning of a model health department is presented in some detail.

Emphasis is put upon the opportunity for investigation. Possible lines of special study with the view to increasing efficiency are enumerated under the following heads:

Factors contributing to accidents
Causes of occupational disease
Non-industrial health conditions
Absenteeism and labor turnover
Stocktaking of physical assets
Physical and temperamental requirements of various processes
Co-operation with other departments.

The importance of non-industrial as well as industrial sickness is illustrated by several sets of figures compiled by the U. S. Public Health Service, the New York City Health Department, and by the Metropolitan Life Insurance

Company, all suggesting the economic losses due to illness.

Factory inspection is naturally referred to as the means by which the physician must obtain his information upon lighting, ventilation, personal service and other environmental conditions. Education in personal hygiene is mentioned last as constituting a large part of the plant physician's duty to his workers. — H. W. Stevens.

Varying Systems in Plant Hospitals. *Sanford DeHart.* Hosp. Management, Aug., 1920, 10, No. 2, 50–52. — The author considers that medical and surgical requirements, together with the element of hazard, differ so widely in different factories that standardization of medical service is impractical. — L. A. Shaw.

Medical Service for Cement Workers. *Charles E. Coleman.* Hosp. Management, July, 1920, 10, No. 1, 62. — The two plants which Dr. Coleman represents, Marquette Cement Manufacturing Company and Lehigh Portland Cement Company, Oglesby, Illinois, have a centrally located first-aid room with all necessary equipment for treating injuries and making physical examination of employees, and first-aid cabinets in the various departments. The more serious cases are taken to the hospital, as neither company has a plant hospital.

Dr. Coleman outlines his methods of physical examination, of preventing infection of wounds, of treating cases of shock, cases of cement in the eye, and burns. — L. A. Shaw.

Medical Service of General Electric Company. Hosp. Management, Aug., 1920, 10, No. 2, 54, 56. — This article describes the methods employed by the General Electric Company in the administration of medical service throughout its plants in Schenectady. — L. A. Shaw.

Two Hundred Cases Treated Daily. Hosp. Management, July, 1920, 10, No. 1, 58. — This short article deals with the work of the Burroughs Adding Machine Company hospital at Detroit. Although the majority of cases treated are finger injuries, the hospital is equipped to handle nearly every variety of ailment. All of the dressings used in the Burroughs hospital are sterilized by means of a Rochester steam sterilizer and the equipment is kept up-to-date in every respect. The surgical instrument case contains all of the instruments that might be required in any emergency. — L. A. Shaw.

How Can Medical Service Be Improved? *Morton R. Gibbons.* Proc. 6th Ann. Meeting Internat. Assn. Indust. Accident Boards and Commissions, U. S. Bur. Labor Statis., Bull. No. 273, Aug., 1920, 288–293. — Any plan should take into consideration the psychology of the injured workman and free his mind of apprehension. It should provide the proper environment and it should provide the proper surgical care; it should include the lately well-learned lessons of occupational therapy, physiotherapy and re-education; it should include a certain discipline to which the injured individuals should be subjected in order that they may not avoid the necessary treatment and environment. — Barnett Cohen.

How Can Medical Service Be Improved? *Otto P. Geier.* Proc. 6th Ann. Meeting Internat. Assn. Indust. Accident Boards and Commissions, U. S. Bur. Labor Statis., Bull. No. 273, Aug., 1920, 284–287. — The worker is entitled to more prompt attention, to better surgical and hospital care and to more scientific rehabilitation than he is today receiving on the average. Industrial accident commissions should take a wider view of their public trust; should seize upon the fundamental program of the prevention of occupational disease and accident as a part of their obligation to the state; and should appreciate the absolute necessity of thoroughly supervising all of the surgical and hospital attention received by the injured worker. Otherwise, enormous unnecessary economic loss and suffering will continue to prevail. — Barnett Cohen.

The Securing of Proper Medical Service for Injured Persons. *John W. Trask.* Proc. 6th Ann. Meeting Internat. Assn. Indust. Accident Boards and Commissions, U. S. Bur. Labor Statis., Bull. No. 273, Aug., 1920, 278–283. — The question for the U. S. Employees' Compensation Commission resolves itself into ascertaining who the competent, well-trained surgeons with necessary temperamental qualifications are, and where located, and placing the injury cases in so far as possible under their supervision and care. The matter of hospitals is of little concern as compared with the sur-

geons. Where the service of a specialist is indicated, such service should be furnished. The experience of the federal commission has been that the whole question of adequate medical service to its beneficiaries depends upon getting the injured employee under the care of a well-trained, competent surgeon who will conscientiously do whatever is possible in the physical restoration of the patient. The injured secures the maximum of benefit at minimum cost to the government. — Barnett Cohen.

INDUSTRIAL PERSONAL AND COMMUNITY HYGIENE: HOUSING, ETC.

Company Housing in the Bituminous Coal Fields. *L. Magnusson.* U. S. Bur. Labor Statis., Month. Labor Rev., April, 1920, 10, No. 4, 215–222. — A survey of mining towns made by the Bureau of Labor Statistics in 1916, with special reference to housing by employers, showed that the responsibility for the housing of a large proportion of miners in the United States has been undertaken by the mine operators; that the average company mining town has few of the amenities of ordinary community life; that the average miner's house has about four rooms; and that the rents are comparatively low.

Observations made especially of the bituminous coal region led to the conclusion that the chief characteristic of every company mining town is its uniformity; that streets are usually wide and lots ample; that sidewalks are infrequent; that the desire to locate houses near the mines has often led to the sacrifice of conditions of health and comfort; and that sometimes advantage has not been taken of prevailing winds in placing houses so as to avoid smoke from ovens. The type of house used in the bituminous coal region of western Pennsylvania has changed very little from what it was in the early days of coal mining. Two plans prevail — the single or detached house and the double or semi-detached house — although a few row houses are found in the Pennsylvania and West Virginia and the Colorado and Wyoming districts. The prevailing plan of house in the Birmingham district is a hip-roofed cottage about 28 feet square, with a chimney in the center of the roof, a front porch running the full length of the house, and a small porch in the rear. A type of house peculiar to all southern towns is the so-called "shot-gun" house, shaped like an oblong box, and divided into three rooms in a row, with the doors frequently connecting the rooms in alignment. The prevailing size of dwelling for a family in the Pennsylvania and West Virginia bituminous coal region is either three or four rooms. A considerable proportion of two-room houses is found in the bituminous coal regions of Alabama, Tennessee, and Kentucky. (A table shows the percentage of company dwellings having specified number of rooms per dwelling, by industry and district.)

Sanitary conveniences are rarely found in mining towns. Less than 2 per cent. of the houses in the bituminous districts have inside toilets. In the anthracite coal mining regions the percentage is 19.2; in the iron mining districts 12.0; and in the copper mining districts, 45.0. There is an absence of careful maintenance in company mining towns except in a few striking instances. There is no garbage collection or provision made for garbage disposal in thirteen of fifty-three communities. Generally speaking, where the company observes system in keeping streets and alleys clean and in repairing houses, and has a regular man or corps of men to do that work, yards also are in a better condition. It is the experience of the general superintendent of one of the largest coal and coke companies in western Pennsylvania that once the company provides an adequate house and sightly premises, the employees, and especially the wives of employees, take a new interest in the house.

The percentage of company houses renting at specified amounts per month, by industry and district, is shown in a table, and the article is illustrated by eight photographs. — G. E. Partridge.

Provisions for Housing Women Employees. Nat. Assn. Corporation Training Bull., Nov., 1920, 7, No. 11, 489–491. — A survey of about three hundred industrial and commercial organizations shows that eleven of them have established dormitories or other special housing facilities for their women employees. Some companies assist in the housing of their employees by subsidizing the local

Young Women's Christian Associations, and others offer a certain amount of help by maintaining directories. The dormitories reported range in size from accommodations for twenty-eight girls to accommodations for 120. As a rule two or more girls share a room, although most of the dormitories have a few single rooms. Generally no salary limitations or other such limitations are prescribed for the privilege of living in the dormitories. In no case reported are the houses self-supporting, and in the majority of cases the housing is regarded as a temporary measure, made necessary by present conditions. — G. E. Partridge.

INDUSTRIAL INVESTIGATIONS AND SURVEYS

A Study of Output in Silk Weaving during the Winter Months. Industrial Fatigue Research Board Report No. 9. Textile Series No. 3. His Majesty's Stationery Office, London, 1920, pp. 69. — The conclusions arrived at in this investigation are as follows:

"1. Because of the great variety in the kinds of cloth manufactured and the variability of the quality of the materials, the measurement of distribution of output is peculiarly difficult in silk mills, and deductions from the measurements can only be made from any general tendencies they display.

"2. Various influences at work at different parts of the day are sufficiently powerful to determine a definite shape for the curve of distribution of output during the day. The main departures of this curve from the ideal curve — the straight line — occur at the beginning and end of the day. On the whole the investigation tends to support the conclusion that unbroken $4\frac{1}{2}$-hour and $4\frac{1}{4}$-hour spells of employment are too long, but it does not appear to be possible to settle the point at issue merely by measurement of output rates; the need for a test of a physiological or psychological nature to determine the degree of fatigue existing in the individual at any instant is emphasised.

"3. Any fatigue developed during the day by the average worker is not carried over to the next day in sufficient degree to affect the rate of output on that day. This is a generalization only — it may not be true for exceptional days.

"4. The 'Monday effect' is present among silk weavers. Its real effects were increased in the investigations described by the lower weaving qualities of the materials on Monday morning, owing to their standing during the week-end in reduced temperatures.

"5. A gradual increase in the output of silk weavers occurs from December to March, the period covered by the investigation. This increase is occasioned principally by the reduction of the length of time of the day in which artificial lighting is necessary, and to a smaller degree by the disappearance of the depressing influences of the winter months.

"6. Under artificial illumination production falls, even if electric light of sufficient intensity is provided. The magnitude of this fall is of the order of 10 per cent. of the daylight value of the rate of output. Every unnecessary hour under artificial light means a direct loss of production and makes the task of the worker more difficult than it need be.

"7. Much time is lost by workers and managements in many silk mills. The development of greater co-operation between managements and workers in these mills will have to take place before much improvement can be effected. In every mill a simple analysis of time-keeping should be prepared for the benefit of the whole industry.

"8. Efficiency and output records should be kept wherever possible.

"9. Output could in many cases be increased greatly if: (a) detailed plans for the weavers' work were made sufficiently far ahead; (b) it were made possible for weavers to spend all the time they are at the works in making cloth; (c) modern methods of management were applied sympathetically to promote better relations with the workers, and to provide them with an incentive to keep good time.

"10. 'Making-up' day disturbs the normal rates of output. It is a mistake to 'make-up' in the middle of a day, particularly if that day is near the end of the week.

"11. Within a temperature range of 58° F. to 65° F. output tends to increase with temperature. The temperature of a silk-weaving shed or room should not be allowed, during the night or week-end, to fall many degrees below the working temperature of the rooms. (The existing practice in one of the most efficient mills visited is to prevent any fall of temperature below 60° F. at night or during the week-end.)

"12. No relation between output and humidity has been disclosed." — M. C. Shorley.

INDUSTRIAL SERVICE AND MUTUAL BENEFIT ASSOCIATIONS

Model Benefit Association. Hosp. Management, Aug., 1920, 10, No. 2, 58. — The Westcott Mutual Aid Union of the International Harvester Company, Richmond, Ind., is an example of a well-organized and efficient employees' mutual benefit association that is adapted for a plant employing from fifty to one thousand men. The operation of this association is herein outlined. — L. A. Shaw.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

Scope and Operation of the Workmen's Compensation Laws of the United States. *Lindley D. Clark.* U. S. Bur. Labor Statis., Month. Labor Rev., April, 1920, 10, No. 4, 14–32. — A questionnaire of the British government on the subject of compensation to workmen for injuries was submitted to the Department of Labor for information as to conditions and results under the laws of the various states. The questionnaire is a very comprehensive one, and includes questions about the scope of the system, its character, different methods of insurance, organization of state funds, organization of mutual associations, cost of compensation, benefits, malingering, the determination of claims, contemplated or demanded changes, voluntary insurance of persons not subject to compulsory insurance. Under each of these headings a condensed statement of the results of the inquiry is made. The data are necessarily too detailed to summarize, but such findings as the following may be mentioned.

The occupations and industries included vary in the laws of the forty-two states having legislation on the subject, some laws being enactments covering practically the whole body of industrial activities, while in others there is a limitation to hazardous employments or extra-hazardous employments. Domestic and farm labor is very generally excluded. Industrial or occupational diseases are specifically covered by the laws of but three states — California, Connecticut, and Wisconsin.

No general statement can be made of the reasons why systems vary as they do in the forty-two states having compensation laws.

A state fund exists in seventeen states, being exclusive or monopolistic in eight and competitive in nine. Where the fund is not exclusive, insurance may be carried by either private or mutual companies.

The administrative methods of each state fund are prescribed by the statute creating the fund. In the majority of cases a board or commission of three persons has charge of the fund as well as of the making of awards and the settlement of disputes. In a few states administrative expenses are borne in whole or in part by the state, but the tendency appears to be to make the system self-supporting.

The benefits paid usually amount to from 50 per cent. to $66\frac{2}{3}$ per cent. of the wages earned at the time of the disability. Usually the same percentage of wages is paid regardless of the period of the disability.

Medical and surgical aid is included at the present time in practically all laws, though omitted from some in their first enactment. No state of the Union has thus far enacted legislation providing for sickness or invalidity insurance.

The main results of the study are conveniently arranged in tabular form. — G. E. Partridge.

Medical Aid under the Compensation Act. *Chesla C. Sherlock.* Am. Machinist, Nov. 4, 1920, 53, No. 19, 844–846. — The attitude of the law toward the subject of medical aid for industrial workers is, in general, quite well defined. The author covers such matters as the rights of employer and workman in choosing a physician, the law regarding operations, the changing of physicians and the amount of expense for medical aid. — G. M. Fair.

Wounds of the Head and Compensation Laws. *C. L. Dana.* Arch. Neurol. and Psychiat., Nov., 1920, 4, No. 5, 479–483. — About 15 per cent. of the applicants for workmen's compensation in New York State complain of nervous symptoms, and a great many of these have received wounds of the head. They tell stories which are startlingly similar. Their syndrome is: headache, vertigo, insomnia, irri-

tability, anxiety, depression, memory defects, fatigability, tinnitus, partial deafness and loss of weight. About 10 per cent. of these cases are just made uncomfortable by their symptoms; in over 50 per cent. the patient is so worried and depressed that he cannot concentrate, and refuses to work; the remaining cases are of those who at first show no symptoms, but who later develop the syndrome after suggestion from sympathetic friends, still later exaggerating and becoming malingerers.

The psychology in most cases is simple. Most of the patients are dull, ignorant, and do not appear to have organized subconscious mechanisms. They are uncomfortable, suffering, apprehensive, hopeful of getting a sum of money, or perhaps enjoying idleness for the first time.

The conclusions are that the compensation laws should be modified so that the patient would receive early neurologic advice and treatment. — S. Cobb.

Compensation Table for Visual Losses of One Eye. *F. Allport.* U. S. Bur. Labor Statis., Month. Labor Rev., April, 1920, 10, No. 4, 187–188. — The old Snellen test type fractions are recognized everywhere as misleading; for instance, 20/40 does not mean a one-half loss of vision, nor 20/50 a three-fifths loss, and yet this is the method of estimating lost vision prevailing in the courts. The Chicago Ophthalmological Society has recently adopted a table representing its official opinion as to what constitutes a fair basis of settlement of visual losses in one eye following accidents, etc. The table (abridged) follows:

20/20	indicates	no loss of vision.
20/30	"	5.5 per cent. loss of vision.
20/40	"	11.0 per cent. " " "
20/50	"	16.5 per cent. " " "
20/60	"	22.0 per cent. " " "
20/100	"	44.0 per cent. " " "
20/150	"	71.5 per cent. " " "
20/200	"	90.0 per cent. " " "

If the vision is worse than 20/200, industrial blindness is regarded as complete. — G. E. Partridge.

The Legislation Concerning Industrial Accidents Extended in France to Include Saturnism and Mercurialism. Il Lavoro, Aug. 31, 1920, 12, No. 4, 112–115. — The law of 1898 in France providing compensation for industrial accidents was extended in October, 1919 to cover industrial lead poisoning and industrial mercurialism. All of the industries are enumerated in which these two metals and their compounds are encountered by the workman. — A. Hamilton.

Determination of the Reduction in Occupational Efficiency of War Cripples. *Karl Meixner.* Wien. klin. Wchnschr., May 13, 1920, 33, No. 20, 428–429. — Any scheme attempting to set down in percentages the degree of occupational disability is wrong in that the degree of injury in any single case remains unprovided for. If the percentages represent average values, what can they signify when the range may be between zero and 100 per cent.? The loss of a finger to a flute-player may be vital from the occupational standpoint, while to a laborer or a blacksmith such a loss would be practically insignificant. — Barnett Cohen.

Disabilities as Aggravated by Pre-existing Conditions. *John W. Mowell.* Proc. 6th Ann. Meeting Internat. Assn. Indust. Accident Boards and Commissions, U. S. Bur. Labor Statis., Bull. No. 273, Aug., 1920, 220–228. — Many workmen possess physical or pathological handicaps which are aggravated by occupational mishaps and which may often be contributory causes to accidents. These conditions are divided for convenience into three classes: (1) congenital defects; (2) handicaps due to previous injury; (3) disease existing in the individual prior to the accident which causes him to apply to a compensation commission for relief.

Under (1) are mentioned all forms of defective vision, defects of hearing, skeletal deformities, patulous inguinal canal, and unstable nervous temperament. In claims for compensation where these defects are present, it is hard to delimit the amount of injury actually due to the accident. Under (2) permanent partial disability due to previous injury is pretty well defined and usually readily determined. Under (3) all kinds of pathological conditions may be present in the workman. If he is injured in an accident he may claim that the prior pathological condition was due to or accelerated by the accident. Such conditions must prevail until there is in the office of the compensation commission a record of the physical examination of every workman and until there is a requirement that a general physical examina-

tion be made at stated intervals and that a record of this be filed with the commission. Then will it be possible to separate the conditions which the individual had before his injury from the results of accident itself. — Barnett Cohen.

Employees' Emergency Insurance Organizations. Nat. Assn. Corporation Training Bull., Nov., 1920, 7, No. 11, 514–517. — "A description of a plan which has been tried out in a large organization whereby employees co-operate through a mutual insurance plan to provide ready money in case of death of the wage earner." The association described is a voluntary association maintained by employees without assistance from the company, and without payment of salaries to officials. A fund is accumulated automatically by the payment of small entrance dues, and an assessment in case of the death of one of the members. The sums yielded in these cases have been relatively large, and the association is regarded as practicable and successful, and is especially recommended for its simplicity of operation. — G. E. Partridge.

REHABILITATION OF DISABLED EMPLOYEES

Present Status of Industrial Rehabilitation. Vocational Summary, Oct., 1920, 3, No. 6, 84–86. — "Since the 2nd of June, when the President signed the Industrial Rehabilitation Act, industrial rehabilitation has become a fact, and persons injured in industry or otherwise now have a distinct claim upon the Government." Vocational rehabilitation includes the idea of restoration and elimination of vocational disability of whatever origin, whether of disease or of accident or of inheritance.

Some definite action leading towards the vocational rehabilitation of disabled persons has been taken in twenty-four states, and, of these, twelve states had assumed some responsibility for the rehabilitation of the disabled before the federal act made federal aid possible. The original plans differ in different states, and may need in some cases to be altered to meet the requirement of the federal act. In many of the states the industrial accident board or commission has been designated as the administrative agency. One state has given the work into charge of the department of public welfare and the workmen's compensation bureau, and the department of labor has been named in other states. Four states named the state board for vocational education. A plan for co-operation between the state board for vocational education and the board or agency administering the workmen's compensation law is a definite requirement of the federal law.

Money has been appropriated by twelve of the states, to be used in the work of rehabilitating the industrially disabled. Some state acts have authorized the use of existing institutions, while a few have provided for the establishment of special schools.

A brief statement of the progress of vocational rehabilitation in each state in which such progress has been made is appended to the general report. — G. E. Partridge.

Reclamation of the Physically Handicapped. *Harry E. Mock.* Jour. Am. Med. Assn., Nov. 20, 1920, 75, No. 21, 1406–1409. — The duty of the physician does not comprehend simple healing of the patient but also returning him to the best degree of usefulness.

"Statistics show that annually 875,000 men and women are disabled for more than four weeks as the result of accidents sustained in industry; that annually 76,000 people suffer loss of members, and at least 200,000 are otherwise permanently disabled by these industrial accidents, and that 28,000 of our people are annually killed by industrial accidents.

"Because of the nonreporting of occupational diseases, it is impossible to obtain statistics; but it is conservatively estimated that at least 250,000 more people are annually permanently disabled as the result of occupational diseases, and the deaths from these reach into the tens of thousands. Thus, the total number of permanently disabled from industry can be placed at half a million."

Certain of the author's conclusions give his general conception of the way in which this vast horde of injured should be handled.

"The knowledge that more than three times as many men and women were being disabled in industry annually as were disabled in our entire army has awakened the nation's conscience to the need of rehabilitating these unfortunates and of preventing such a casualty list.

"In different parts of the country, volunteer

and governmental agencies are endeavoring to solve this problem.

"A reclamation service to be complete must combine the efforts of medicine, education and industry. It must include the following services:

"(*a*) Prevention of accidents and disease.

"(*b*) Improved hospital, medical and surgical services. As an adjunct to these there must be provided better convalescent care.

"(*c*) Vocational training of the handicapped when needed.

"(*d*) Proper placement of the physically and mentally handicapped on jobs where they can be efficient with 'safety to themselves, to their fellows and to property.'

"(*e*) Their continued supervision until assured that this reclamation service is completed in every instance." — C. K. Drinker.

WOMEN AND THE INDUSTRIAL REHABILITATION ACT. Vocational Summary, Oct., 1920, 3, No. 6, 86–87. — The industrial rehabilitation act applies equally to men and women, and the term "persons disabled" is interpreted to include all persons who, by reason of a physical defect or infirmity, whether congenital or acquired by accident, injury, or disease, are or may be expected to be partially or wholly incapacitated for remunerative occupation.

The number of women in industry signifies the need for provision for their vocational rehabilitation; twelve million is a conservative estimate of the present number, or about one-third of all persons in the country who are gainfully employed. Besides the women engaged in occupations included above, there are 25,000,000 women and girls over 10 years of age occupied in their own homes, and among them are women disabled by disease or through injuries of childhood who should receive the benefits of vocational training.

The small percentage representing the number of accidents to women, as shown by the statistics, should not be regarded as an indication of a lack of need for their vocational rehabilitation. Industrial accidents reported are largely those referred to in compensation laws, and women workers have not yet been included to any great extent in the provisions of compensation legislation. Moreover, workmen's compensation laws do not cover domestic service which until recently included about one-third of employed women — nor do they include agriculture which (except in New Jersey and Hawaii) engages approximately a fourth of women workers. Another fact, of a different character, affecting the statistics, is the natural caution of women; the reduction of the number of accidents in some plants since the employment of women has been so great that women have been retained as workers instead of men.

The appointment of a woman as supervisor of the rehabilitation of women in each state should be encouraged. The success of the work of industrial rehabilitation depends upon the degree of personal effort expended, and the consideration given to each case, and women possess special qualifications to meet these requirements. — G. E. Partridge.

STATE TO EXPAND REHABILITATION WORK. Hosp. Management, Sept., 1920, 10, No. 3, 56–57. — The first state rehabilitation clinic established in the United States for the treatment of men and women injured in industrial pursuits has been functioning for several months in Newark under the direction of the New Jersey Rehabilitation Commission. Physical reconstruction and vocational rehabilitation are the primary objects aimed at by the commission. The work of the clinic is essentially diagnostic and reconstructive, since it is conducted principally for ambulatory and short convalescent operative cases. The work of the commission and its clinics does not stop with reconstruction; it attempts through placement officers to find suitable occupation for those who come under its care. — L. A. Shaw.

THE BLIND IN THE METAL-WORKING INDUSTRY. Indust. Management, Oct., 1920, 60, No. 4, 314. — This editorial calls attention to the development of employment for the blind in skilled or semi-skilled operations in Cleveland. At the present time there are eighty-one blind men and women working in forty different plants. These people have gone into industry on the same basis of wage payments and other conditions of employment as their fellow workmen who see. The types of work at which they are employed include assembling, bench work, etching, inspecting, operating drill presses and other metal-working machines, packing, stacking, straightening, taping, etc. — C. H. Paull.

ABSTRACT OF THE LITERATURE

OF

INDUSTRIAL HYGIENE

VOLUME II APRIL, 1921 NUMBER 12

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GENERAL

AFTER-THE-WAR LABOUR CONDITIONS AND FACTORY PERSONNEL. *T. Oliver.* Jour. State Med., Aug., 1920, 28, No. 8, 229–235. — Some difficult problems of industry have risen after the war. The situation is made more difficult because of the thousands of disabled men needing rehabilitation. Great Britain has undertaken to provide for the training of those disabled in the war, but this offer needs to be extended to those who have been injured in industrial work — an obligation already foreseen before the war by Denmark and by Belgium. There is need of thorough investigation of the question of production with reference to length of periods of work and of the determination of hours of labor for each occupation, following results such as those already obtained by Fromont at Engis before the war. Fromont, for example, showed that in the case of zinc smelters as much work was done in a seven and a half hour day as had previously been done in a ten-hour day. It may safely be said that the day is past when long hours are regarded as consistent with the greatest production, and the day has come when all industrial work must be regulated in accordance with the physiology of fatigue and with the principles of the new science of industrial physiology. — G. E. Partridge.

CHRONICLES OF SOCIAL HYGIENE: INDUSTRIAL HYGIENE. *A. Elster.* Öffentliche Gesundheitspflege, 1920, 5, No. 2, 61–69. — Brief summary of the reports of the Prussian Labor Bureau for the war years shows that during the first two years conditions were favorable — indeed, the figures for sickness diminished because the workers forgot small illnesses for their country — but, from 1916 on, sickness increased. The chief affections were digestive diseases, nerve weakness and irritability, and skin diseases, especially furunculosis. There was much fainting in women, and even in men, and the workers appeared to be thinner and paler than usual. The principal causes assigned for increase in sickness were: the employment of weak workers, especially women and children, long hours, poor food, exposure to industrial poisons, lack of protective devices, small number of doctors, and the prevalence of influenza, particularly in 1918.

The Saxon reports show a decrease of accidents at first, with a rise after the revolution. The large number of women workers were more

careful than the men, but the children were very thoughtless. In the textile industry trouble was less, but in machine and metal work accidents were increased. Some severe explosions in munition factories led to strict regulation of the making and storing of explosives. The poor potato crop of 1916 was followed by the "cabbage winter." This and the lack of soap endangered the health of the workers.

In Württemberg there was a steady increase in the number of cases of sickness among the workers from 1914 to 1917. The chief diseases were colds and indigestion, and anemia in the women.

The Austrian legislature had presented to it a bill concerning labor of women and children in the fall of 1918. On May 14, 1919, a law was made forbidding night work, except in those trades which by their nature required it. On the next day a law was made regulating the rest time in stores and banks.

On November 22, 1918, an eight-hour day law was made; then the time in bakeries and confectioneries was limited to nine hours, the Sunday rest from 5 P.M. to 9 A.M. was legalized, and more protection was given to youth. In October, 1919, the Prussian legislature turned down a bill for the reform of industrial hygiene which provided for the appointment of doctors trained in hygiene as officials.

This brief outline of legislation gives some idea of the progress of industrial hygiene in Germany, but a better indication is given by a glance at the suggestions made by Germany for the labor section of the peace treaty. Articles 387 to 427 of that document are concerned with the formation of an international labor court and with the statement of general principles, such as the eight-hour day, living wage, right to organize, etc. But Germany wished to go more into detail, as follows:

1. All states are to be obliged to formulate laws for hygiene in all kinds of trades, and especially concerning accident and sickness insurance.

2. Effective directions are to be given for the protection of workmen in dangerous trades.

3. The use of industrial poisons is to be stopped as far as possible.

4. A special international law for seamen is to be worked out in co-operation with the seamen's organization.

5. An eight-hour day for all workmen.

6. Women to work only four hours on Saturday.

7. The working age of children to be set at fourteen, with time off between fourteen and eighteen for continuation schools.

8. Women to be given ten weeks off at childbirth, six weeks to be after delivery.

9. Employers forbidden to give women work to do at home after hours.

10. Equal pay for equal work.

11. Night work forbidden, except in those trades which by their nature require it.

12. Weekly rest of thirty-two hours, and shifts regulated so that at least every third Sunday is free.

13. Home work to be regulated in the same manner as factory work.

14. Home work forbidden in trades that involve the handling of poisons or foods.

15. Home work to be stopped when certain contagious diseases occur.

16. Minors employed at home work to be carefully watched by doctors.

17. Employers of home workers to publish lists of workers and their pay: a minimum wage to be established.

18. Employers of more than five foreign workers: (a) to post the labor laws in their native tongue; (b) to see to it, at their own expense if necessary, that the workers know the common trade terms in the language of the country.

19. Protection of labor by a department chosen from labor; annual reports to be published, together with the norms of other countries.

20. Labor organizations to see to the actual carrying out of protection through their committees and officials. — H. G. Noyes.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

Carbon Monoxide Poisoning from the Use of Petrol Engines: Some Experiences during the War. *D. Dale Logan.* Jour. State Med., Oct., 1920, 28, No. 10, 306–319. — The author recites various experiences demonstrating the need for extreme precaution in the management of air compressors in places dependent upon them for ventilation. Obviously,

a compressor driven by a gasoline engine and sucking up the exhaust from the engine will not deliver a healthful product to the ventilators leading to mines and galleries. But this is what actually happened under stress of war conditions. — Barnett Cohen.

THE POSSIBILITY OF HYDROGEN SULPHIDE POISONING IN TANNERIES. *Holtzmann.* Abstracted as follows from Zentralbl. f. Gewerbehyg., Dec., 1919, 7, No. 12, 214 by Holtzmann in Hyg. Rundschau, July 1, 1920, 30, No. 13, 409. — "Kalzin, a calcium sulphur compound, often used in tanneries with the slacked lime, whem mixed with acids leads to a violent evolution of hydrogen sulphide fumes, which have already exacted their sacrifices." — E. L. Sevringhaus.

THE CONVERSION OF AIR INTO A LETHAL MIXTURE OF GASES BY STORAGE OF TOBACCO AND OTHER VEGETABLE SUBSTANCES. *Robert C. Frederick.* Jour. Hyg., Oct., 1920, 19, No. 2, 205–207. — Under certain conditions and after elapse of sufficient time, tobacco stored in an unventilated space, provided there is 10 per cent. or more of moisture present, converts air into a mixture of gases entirely incapable of supporting human life. Laboratory tests in glass bottles showed a percentage of 49.95 carbon dioxide and 0.21 oxygen after eighteen days at 12 to 37° C. — Henry Field Smyth.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT AND PREVENTION

INVESTIGATION OF THIRTY-FOUR CASES OF HUMAN ANTHRAX OCCURRING IN NEW YORK CITY DURING 1919 AND 1920. *S. Dana Hubbard* and *William Jacobsohn.* Month. Bull. Dept. Health, N. Y. City, Nov., 1920, 10, No. 11, 249–266. — The authors present case histories of a series of thirty-four cases of human anthrax occurring in New York City during a period of twenty-one months in 1919 and 1920. It is shown that anthrax cases are increasing in New York City, there being more than four times the number of deaths in the five-year period, 1915 to 1919, than in the preceding five-year period, 1910 to 1914.

A summary of the 34 cases shows that 15 of the cases occurred in artisans handling infected material as follows: trucking (unloading, sorting, loading and counting hides and skins), 8 cases; manufacturing brushes (handling anthrax-infected hair), 5 cases; millinery (handling infected hair cloth and hair braid), 1 case; house cleaning (handling infected hair dust brush), 1 case. Seventeen of the cases resulted from using new, anthrax-infected shaving brushes. In two of the cases the mode of infection was unknown. Twenty-four of the cases were thus from contact with hair and 8 from contact with hides.

Treatment is discussed and the conclusion reached that seemingly the most successful treatment is the administration of anti-anthrax serum, 10 c.c. by local infiltration, every eight hours; and 40 c.c., intravenously, every four hours, without operation.

It is concluded that adequate disinfection of hides and skins, under expert supervision, at the place of origin, shipment, or receipt, is necessary to prevent future occurrence of anthrax among such handlers. Similarly sterilization of hair must be done before manipulation is permitted. Section 230 of the Sanitary Code of the Department of Health, requiring such proper sterilization, is quoted. — Henry P. Carr.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

CAUSES OF SKIN SORES AND BOILS AMONG METAL WORKERS. AN INVESTIGATION BY THE HOUGHTON RESEARCH STAFF. E. F. Houghton & Company, Philadelphia, 1920, pp. 51. — This is a comprehensive and illuminating study of a serious problem in industrial medicine. The conclusions reached are as follows:

"1. The infection is bacterial.

"2. The bacteria, or germ, is not present in the oil, no matter of what variety or character the oil may be, but exists on the human body.

"3. The germ has no power to create a boil or sore until it has secured ingress to the skin;

or until the skin is broken or some means arise by which the bacteria can attack the flesh.

"4. All cutting oils have skin penetrative powers. This property of penetration is due to the high thermal conductivity of such oils; i. e., their ability to convey heat from the point of generation to the atmosphere. The oils can therefore penetrate the skin, and they do actually penetrate through the pores.

"5. They penetrate the skin of hairy persons much more readily than the skin of those who are devoid of hair, because hairy skins are more vulnerable through their superabundance of capillary pores.

"6. The oil, in penetrating the skin through the pores, carries with it the bacteria which exist naturally on the surface of every living body.

"7. The bacteria also secure entrance to the skin through minute punctures made by metal chips which are carried in solution by the oil to the human body. Many of these chips are so minute as not to be discernible to the naked eye.

"8. These epidemics of boils are more prevalent in hot weather, or under heated working atmospheres, than in cool weather and under cooler working atmospheres.

"9. The sores are not always precisely similar and the bacteria are not always the same.

"10. Sore-producing bacteria have been found in oil, but only in oil which has been used at least once, and not in the fresh oil as it is received from the manufacturer.

"11. The breeding of such bacteria has been traced to unsanitary conditions existing in the establishment where the oil is used. It has been found that workmen often expectorate into the oil as it passes through the machine, spit into the oil tanks, throw garbage or other filth and refuse into the oil, and otherwise contaminate it while it is in use.

"12. Some oils encourage this bacteria breeding, when contaminated, to a greater extent than others. The worst offenders are the oils commonly known as 'paraffine oils.' It must not be inferred that we mean paraffine base oil, or oils made from paraffine base crude. The distillates from paraffine base crude are among the oils least culpable in this respect. These paraffine oils, which are the most favorable culture media, are the ones produced in the process of pressing paraffine wax. The actual difference between these bacteria-carrying paraffines and the other paraffines is that the former are oils pressed from residuum matter while the others come over the still in the distillation.

"13. The most practical preventive of these epidemics of sores is cleanliness on the part of the operatives. The operatives should be instructed to wash up with pure soap; to avoid the very common practice of smearing the body with oil before washing, and to wash as frequently as possible. They should wash every four or five hours on the average and at noon as well, and before supper when they work overtime, as well as when they quit work. They should be taught to change their clothing at least twice a week and wear clean overalls and working clothes. The overalls should be washed at the regular periods set by the time it takes a pair to become soiled. Soiled underclothing, linen and outside clothing help to deposit germs on the skin, foster their growth and aid them in penetrating the skin. When the clothing gets saturated with oil that is permeated with minute metal chips, the rubbing of the clothing allows the metal to abrade the skin, thus affording a place of ingress for bacteria.

"14. The skin of the metal-working operative is no more bacteria-infested than that of any other human being or worker. The metal operative is, however, more exposed to conditions which give the bacteria opportunity to get under the skin and do harm.

"15. The benefit to be derived by incorporating in the oil so-called 'disinfectants' or 'germicides' is negligible. It is a fact, however, that Carbolized Cosmoline, applied to the skin after washing, acts as a preventive of the bacterial infection in question. The carbolic acid content of this preparation, being of a germicidal nature, kills the germs, while the Cosmoline, being of the petroleum family, spreads an oleaginous film which protects the pores from impregnation. Carbolized Cosmoline is, nevertheless, not infallible as a preventive and will most likely fail unless hygienic, sanitary and cleanly precautions are taken. The oil must be protected against contamination of any kind. This includes the best and most modern methods of minimizing the amount of metal chips which are carried off in the oil.

"16. Epidemics of sores are likely to occur in any plant where metal-cutting is done with the aid of oil. Previous immunity from such epidemics is no guarantee for the future. It happened on several occasions during our first

inquiry that we were informed at a plant that no such thing as sores had ever been known there. Then, after a short time, we received from the same concern an inquiry as to how we were getting along with our investigation. They added that they were experiencing an outbreak of sores on their employees ' for the first time.'

"17. Oil plant workers, except those engaged in paraffine pressing plants, are not very susceptible to the infections in question. The Houghton employees, for instance, rarely experience sores and, when they do, the trouble can never be ascribed to the oil with which they come in contact, or to the bacterial infection above outlined and described in the following treatise. Neither has any other oil works that we know of ever had an epidemic of such bacterial infection or irritation due to oils, the paraffine oil pressing plants excepted. We found the epidemic to be quite common in the pressing plants of paraffine wax manufacturers."

Industrial physicians will do well to secure this very serviceable report from E. F. Houghton & Co. — C. K. Drinker.

SCLERODERMA AS A POSSIBLE MANIFESTATION OF CHRONIC ARSENIC POISONING. *Samuel Ayres, Jr.* Arch. Dermat. and Syph., Dec., 1920, 2, No. 6, 747–756. — (*Review by author.*) In the above-mentioned issue of the *Archives of Dermatology and Syphilology* four consecutive cases are described of scleroderma with traces of arsenic in the urine. Since the submission of this paper two additional cases have been found also showing arsenic in the urine. So far as I know this is a new finding not described in any available literature, during at least the past twenty years. It is not claimed that the etiology of scleroderma has been discovered and I wish strongly to emphasize that I am not urging any such ideas. I wish merely to present the facts which have been developed and let them speak for themselves, supported or rejected by whatever evidence the future may bring.

The original suggestion of testing the urine of a scleroderma patient for arsenic was made by Dr. William H. Smith, visiting physician on the West Medical Service of the Massachusetts General Hospital, Boston, in the case of H. E., a young American, thirty-five years old, who had been foreman in a paper-box factory for ten years, and rather constantly exposed to paper dust resulting from the cutting and trimming of paper and cardboard.

This patient presented the typical picture of a moderately advanced case of diffuse scleroderma of about one year's duration, the hands and forearms showing the greatest involvement, with almost complete fixation of the fingers in a semi-flexed position. The face, chest, and abdomen were involved to a less extent. The affected skin showed the characteristic brown pigmentation, glossy appearance, and was so firm and hard that it could not be pinched up in the slightest degree. The palms were nearly always wet with perspiration and were tender to the touch. Earlier in the disease the hands and sometimes the feet were frequently swollen, were often very sore and tender, and the fingers sometimes white, sometimes cyanotic. There had been practically no constitutional symptoms except for insomnia during the past month. At our request he brought three samples of paper and one of cardboard to the hospital for chemical analysis. The cardboard and two of the samples of paper gave positive tests for arsenic.

Five of the cases in the series reported were patients at the Massachusetts General Hospital, and the urine tests for arsenic, all of which were positive, were done in the chemical laboratory of the hospital under the direction of Dr. W. Denis. The sixth case was a private patient of Dr. Richard L. Sutton and the arsenic test was done by the Kansas City Testing Laboratory. Five cases were of the diffuse variety of the disease, one was of the localized or "morphoea" type. Three cases gave clean-cut histories of exposure to arsenic: one was the foreman in the paper-box factory; another was a Russian Jewish housewife who kept a little grocery store in a damp basement and who for the duration of her disease — four years — had kept an open saucer filled with powdered arsenate of lead under her counter to kill mice; the third was a young school teacher who used arsenical sprays in her capacity as director of school gardens.

The possible sources of arsenical poisoning are quite varied. The character of the arsenic which gains entrance to the system is a large factor in its toxic manifestations, arsphenamine under proper conditions being ordinarily non-toxic, arsine gas even in minute amounts being highly poisonous. Individual idiosyncrasy is another important element.

The symptomatology of diffuse scleroderma

and chronic arsenic poisoning in individual cases show a marked parallelism which apparently has not been generally recognized. Symptoms such as the following are common to both diseases: neuritic manifestations; pigmentation, cutaneous alterations of various kinds; loss of weight, strength and appetite; gastro-intestinal disturbances such as pyrosis, abdominal cramps, sore tongue; intermittent, irregular fever; vaso-motor instability, rapid and irregular heart; menstrual disturbances; hoarseness, salivation, etc. Osler described eight cases of scleroderma in the *Journal of Cutaneous Diseases* in 1898. Many of his patients had severe constitutional symptoms suggestive of those seen in chronic arsenic poisoning. In the epidemic of arsenical beer poisoning in England, Brooke and Roberts in the *British Journal of Dermatology* for April, 1901, describe among the commonest initial symptoms, soreness, redness, and swelling of the palms and soles. These are commonly the early manifestations of scleroderma.

If the future should establish chronic arsenic poisoning as an etiology of scleroderma, the following facts may account for the failure in the past to have connected the two processes: (1) the rarity of both diseases; (2) inadequate history in regard to exposure to arsenic in cases of scleroderma; (3) failure to recognize scleroderma, many cases doubtless passing for "rheumatism" or Raynaud's disease; (4) the possibility that scleroderma may be a specialized manifestation of chronic arsenic poisoning and occur independently of other symptoms just as the gastro-intestinal symptoms may for a long time be the only evidence of pellagra.

J. J. Putnam in the *Boston Medical and Surgical Journal* in 1890 found traces of arsenic in 43 per cent. of forty-eight urines selected at random, and very properly concluded that the mere presence of arsenic in the urine was not enought to account for doubtful symptoms, but he also emphasized the fact that the absence of arsenic from the urine did not exclude arsenic poisoning, inasmuch as arsenic was excreted only intermittently, and had not been found in the urine in some cases of acute fatal arsenic poisoning. One of our cases gave two negative tests at two week intervals, and then a positive test after taking a saturated solution of potassium iodide, 10 drops three times a day for eighteen days. It is possible that the potassium iodide liberated the arsenic from the tissues, but this is only a surmise.

Treatment of scleroderma is notoriously unsatisfactory. Heat and massage are somewhat palliative. Thyroid medication has been distinctly disappointing. We have used quartz light therapy but insufficient time has elapsed for definite conclusions. The underlying pathology is a connective tissue hyperplasia with secondary atrophy, including vascular obliteration.

These are the facts, and as before stated they are offered not in any sense as proof, but as indicating a possible line of investigation. — Samuel Ayres, Jr.

THE ECONOMIC ASPECT OF MINERS' NYSTAGMUS. *T. L. Llewellyn.* Jour. State Med., Aug., 1920, 28, No. 8, 236–256. — The average time of eye failure in a series of 1500 cases was forty-one years. The average period of underground work before failure was twenty-five years. About 75 per cent. of the men examined had errors of refraction, and the disease was found so frequently to follow an accident that the connection between the two seems to the writer to be well established. Sometimes the onset of the disease was sudden, but generally a period of twelve months elapsed between the onset of the disease and the final failure.

It is now generally admitted that deficient light in the coal mines causes miners' nystagmus, and the problem of prevention of the disease is bound up with the improvement of illumination underground. In this respect, the conditions are still very bad, since it is safe to say that over 90 per cent. of all the lamps in general use give less than 1 candle-power at the coal face. The greatest improvement has come from the introduction and development of the electric lamp which at present gives from 1 to 1.5 candle-power. With the cap lamp the light is brought so much nearer the working area that the illumination obtained is two or three times as great as that obtained from the ordinary type of oil or electric lamp of the same candle-power. As regards maintenance cost, per shift, of the lamps, Deike gives: for oil or carbide lamps, 6 to 7 cents; sperm candles, 7 to 8 cents; electric lamps, 3.5 to 5 cents. Another help in increasing the light in the mine is whitewashing the pit bottom and the main roads.

Other conclusions reached by the author are: that ill health and mental stress accelerate the onset of the disease and that there is some evidence for hereditary predisposition; that medical examination before engagement might

eliminate many cases; that most cases are convalescent in six to twelve months and free from all symptoms in one or two years; that in the chronic case the mental factor is of great importance; that the economic losses from the disease and the ineffective handling of it and its consequences are very large; that the method of certification for disability should be revised. G. E. Partridge.

Coal Miner's Nystagmus and its Predisposing Causes. *A. J. Martin.* Brit. Med. Jour., Nov. 27, 1920, 2, No. 3126, 814–815. — A comparison is made of the similarities of miner's nystagmus and the anxiety neurosis of war-strained individuals, and it is the author's opinion that both are essentially diseases of exhaustion. He discusses the signs and symptoms of miner's nystagmus and then classifies the predisposing causes as follows:

1. Nature of the work done. Stallmen (88 per cent. of all cases) have great strain on the eyes, and a great responsibility as they are responsible for the lives of their fellow workmen.
2. Excess of alcohol and tobacco. Nystagmus is often worse on Mondays and after holidays.
3. Illness. Several cases followed influenza.
4. Accidents, especially accidents to the eye.
5. Heredity. The tendency to the disease is transmitted as readily by the mother as by the father.
6. Exhaustion, due to want of food, and prolonged strain without rest, the author believes to be the most important, most effective predisposing cause of the disease. Since the Eight Hours Act, he feels that the disease is more common, and as an explanation he suggests that the shorter time allowed for lunch — fifteen minutes — may be a factor. He advocates that the lunch time be increased to at least forty minutes. — J. T. Wearn.

Miner's Nystagmus: Suggestions for its Prevention. *D. Lechmere Anderson.* Brit. Med. Jour., Nov. 27, 1920, 2, No. 3126, 813–814. — The author states it as his belief that no man, the refractive condition of whose eyes is normal, will develop miner's nystagmus to such an extent as to incapacitate him from miner's work. The author then classifies the causes of nystagmus as follows: (1) *predisposing:* (a) errors of refraction associated with the conditions of a collier's work; (2) *exciting:* (a) presbyopia, (b) defective illumination. Heredity may play a part only so far as refractory errors are hereditary. He then recommends as means of prevention the careful examination of the eyes of all applicants for miners' positions, and suggests that if the error of refraction exceeds 1 diopter hypermetropia or myopia, or if astigmatism is present, the man should be excluded from work as a coal miner. — J. T. Wearn.

Abstract of Report on Eye Injuries. *Francis D. Donoghue.* Boston Med. and Surg. Jour., Nov. 4, 1920, 183, No. 19, 558–560. — Normal central visual acuity is not normal vision. One-tenth of normal vision does not mean one-tenth of normal central visual acuity alone. The object is to simplify for industrial compensation boards the administrative procedure in regard to eye injuries by broad interpretation and definitions. Consequently, there is given a definition of normal vision expressed in terms of ability to correctly interpret form at infinity. The test object and illumination are specified, and the examination methods enumerated. A statement is made of what is considered one-tenth of normal vision. — Barnett Cohen.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

The Incidence of Industrial Accidents upon Individuals with Special Reference to Multiple Accidents. *Major Greenwood* and *Hilda M. Woods.* Reports of the Industrial Fatigue Research Board, No. 4, London, 1919, pp. 28. — This is a painstaking study, by a statistical method, of the factors involved in the production of industrial accidents. The authors' problem is to discover, by means of the distribution of multiple accidents in groups in which general liability is uniform, whether accidents occur solely by the principle of chance, or whether individual liability to accident can be detected, in the occurrence of repeated accidents. The mathematical analysis is too complicated to be made clear in a brief abstract, but the main results may easily be indicated. The form of distribution of the items sustains the hypothesis that there is a decided difference in initial liability to accidents on the part of the individuals appearing in the groups studied. This varying individual sus-

ceptibility is, in fact, so important a factor that "given the experience of one period, it might be practicable to foretell with reasonable accuracy the average allotment of accidents amongst the individuals in a subsequent period."

The question is raised whether from the statistical materials anything more can be derived than confirmation of the popular opinion that there exist both careful and careless periods — whether accidents actually are a function of output, etc. The result, so far as the data of the study reported are concerned, is that the differentiation of those who do, from those who do not have accidents cannot be shown to be related to a similar differentiation in regard to output. Those who sustain many accidents are, on the average, neither more nor less productive than their fellows. There is some indication that time lost through sickness is negatively correlated with accidents, but not much significance is attached to the numerical result obtained. Nothing definite or important was found in trying to estimate the correlation between age and accidents.

The article contains thirty tables, a page of mathematical formulas, and some references to other work of a similar nature. — G. E. Partridge.

THE HIGH COST OF THINGS THAT HAPPEN UNEXPECTEDLY. *Sidney J. Williams.* Factory, Oct. 1, 1920, 25, No. 7, 1043–1045. — This discussion looks upon accidents as signs of wasteful procedure. "Accidents in the broad sense are the exact reverse of efficiency whether the accidents injure anyone or not." The writer chooses to ignore completely the effects of accidents upon individuals, looking upon them purely from the standpoint of production. The falling of a casting from a truck on the foot of a workman leads one to believe that the construction of the truck or the method of loading has resulted many times previously in castings falling without injuring the worker. In each case there has been time lost in replacing the casting, assuming that no other loss has been involved. In another case where dust hazard resulted from a certain operation, causing lost time and a decrease in the efficiency of workers, a mechanical adjustment eliminated the dust in the room and saved enough dust to pay 35 per cent. a year on the cost of the change. — C. H. Paull.

REDUCING ACCIDENT RISKS. Factory, Oct. 1, 1920, 25, No. 7, 1068–1074. — Among the suggestions given under this heading are four which are of particular interest. In the Kimberly-Clark Company and the Neenah Paper Company a safety campaign was conducted in which the responsibility for accidents was placed squarely on the foremen. A careful tabulation was made of accidents by departments. During the first six months the number of accidents was reduced from 135 for a corresponding period the previous year to 53.

In a plant where there had been considerable accident risk through rushing to exits at quitting time, a system was inaugurated by which workers from various departments formed lines and marched out in regular order. Not only was the accident hazard eliminated but workers were able to leave the plant in a shorter time.

Under caring for equipment, extracts are given from rules formulated by the Western Pennsylvania Division of the National Safety Council regarding the care of welding equipment.

At the Gilbert and Barker Manufacturing Company plant monthly prizes are given to employees making safety suggestions. At the entrance to the plant is a large sign bearing the words "Be Careful To-day." Each employee upon entering the plant faces this sign. — C. H. Paull.

SOMETHING TO CROW ABOUT. Factory, Nov. 1, 1920, 25, No. 9, 1400. — This article discusses briefly a plan inaugurated by the International Harvester Company for developing competitive interest in the reduction of accidents. Careful records are kept of lost-time accidents in all departments of factories included in the organization. In departments having no accidents posters are placed at the end of the month with the heading "Something to Crow About." In a department where lost-time accidents have occurred a poster is placed with the heading "Nothing to Crow About Here." This second poster asks for recommendations for the reduction of accidents in the department. — C. H. Paull.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

LUNG VENTILATION WITH THE USE OF GAS MASKS. *H. Dreser.* Vrtljschr. f. gerichtl. Med., Jan., 1920, Third Series, 59, No. 1, 54–81. — The dead space, formed by the volume of the respiratory passages, becomes a larger factor in the productivity of a single respiration as the respiratory volume decreases, necessitating more rapid respiratory movements. This condition is simulated if the physiological dead space is increased by having an individual breathe through any apparatus. Marked air hunger is produced if this additional volume is large enough — the "tube dyspnea" of Gad. If this effect is to be avoided in breathing through any apparatus the expired air must be separated at the mouth from the inspired air. Experiments were made with German gas masks to determine whether the form or the volume was the determining factor for the composition of the air inside the mask.

The resistance to the passage of air through the absorption box was found to give rise to a difference of pressure between the air in the mask and the atmosphere, varying from 6–8 mm. water pressure during quiet respiration up to 24–30 mm. during very vigorous respiration. The capacity of the mask was 520 c.c. of air; that of the absorber, 241 c.c. Therefore, 761 c.c. were added to the physiological dead space in these German masks which had no valves to separate the air currents.

To get visual demonstration glass models were substituted for the masks, and ammonium chloride fumes were "breathed" by mechanical means. Using a small glass cylinder it was found that the whole volume of the tube had to be inspired before new air could be inspired, thus involving much rebreathing if the tube were large. With a glass funnel simulating a mask, the larger end covering the "mouth and nose," the fumes were exhaled and then inhalation was observed to secure a mixture of fumes and air from the small opening of the tube, thus involving some rebreathing. If the small end of the funnel were nearer the "mouth and nose" the amount of fresh air inspired was much greater. The Gad tube dyspnea experiment was tried with a subject breathing through a glass tube 5.5 m. long, with a diameter of 33 mm., and a capacity of 4700 c.c. Since vital capacity is about 3500 c.c. no air could possibly enter from the free end of the tube directly into the lungs. The free end was immersed in fumes of ammonium chloride, and, with respiration, the fumes were observed to pass back and forth in the tube with little mixing of air and fumes. The contents of the tube were aspirated from the mouth end for analysis, six successive portions of 500 c.c. each being used and a final portion of 1000 c.c. Respiration was maintained for intervals of $\frac{1}{4}$, $\frac{1}{2}$, 1, and $1\frac{1}{2}$ minutes before analysis. Longer than this was painful. The carbon dioxide content of the air samples nearest the mouth increased from 5.5 per cent. to 7.4 per cent. in the four intervals, and in each case dropped rather regularly toward the distal end of the tube. The concentration in the most distal sample was, however, always above normal for the atmosphere. Oxygen in the tube varied from 13.0 to 8.1 per cent. in the proximal samples, and from 20.8 to 17.8 per cent. in the distal samples. The cause of the intense air hunger which occurred at the end of one and a half minutes is said to have been the diminution in oxygen in the proximal part of the tube, since there was a more marked decrease in the oxygen than an increase in the carbon dioxide as the time of the experiment became longer.

Using a glass funnel, to the small end of which was attached an absorption box of a gas mask, two tubes, whose capacity is not stated, were arranged with valves, the one to permit inspiration from the "mask" and the other expiration to the mask. The capacity of the funnel and absorber together was 1800 c.c., twice that of the gas masks. It is calculated that with only the oxygen in the lungs and in the mask and absorber, discomfort from air hunger would occur in not over one and a half minutes. There was no discomfort from the use of this apparatus for five minutes, whence it is concluded that oxygen must enter the mask. After such use 100 c.c. samples were drawn from each tube, but it is not stated whether such sampling took only air from the tubes. The expiratory tube had 5.4 per cent. carbon dioxide, and 15.8 per cent. oxygen. The inspiratory tube sample had 2.7 per cent. carbon dioxide and 18.3 per cent. oxygen. Since this size and form of apparatus caused no serious diminution of oxygen, the gas mask of similar design but half as large is probably safe.

By an apparatus described at length, the equivalent total opening through the absorption box of a German mask was found to be 21 sq. mm., which is about one-sixth that of the wide open human glottis.

It is commonly accepted that the air to be respired ought to contain at least enough oxygen to support the combustion of a candle. A candle is extinguished at about 15 per cent. oxygen, although human respiration does not become uncomfortable until oxygen is reduced to about 10 per cent. A mask was fitted with an extra tube so that samples of air could be withdrawn for analysis. With a soldier sitting quietly and breathing regularly through the mask, samples of over 100 c.c. were drawn without attention to the phase of respiration. The carbon dioxide varied from 3.3 to 3.7 per cent., the oxygen from 16.9 to 17.5 per cent. When samples were taken during only one phase of respiration the variation was greater: expirations — carbon dioxide 2.8 to 4.1 per cent., oxygen 16.9 to 17.8 per cent.; inspirations — carbon dioxide 0.9 to 1.4 per cent., oxygen 19.3 to 19.6 per cent. Another series of inspirations, with a slightly different method, gave carbon dioxide 1.9 to 2.6 per cent., oxygen 18.3 to 19.0 per cent. A third series with a still different method of sampling gave carbon dioxide 2.2 to 3.2 per cent., oxygen 17.6 to 18.1 per cent. With an automatic apparatus for sampling, inspirations were carbon dioxide 0.6 to 1.4 per cent., oxygen 19.5 to 20.2 per cent.; expirations were carbon dioxide 2.4 to 2.8 per cent., oxygen 18.4 to 19.2 per cent. In this latter series the method gave samples with too high a proportion of air freshly drawn in from the absorber. The outer limits on all these samples were, thus, carbon dioxide 0.6 to 4.1 per cent., oxygen 16.9 to 20.2 per cent.

A better picture of what actually takes place is given by holding the breath at the end of a normal expiration. Samples aspirated from a mask at this point show what would have been breathed at the following inspiration. Successive samples taken thus showed decreasing content of carbon dioxide and increasing content of oxygen. The average percentages of carbon dioxide and of oxygen which might be thus inspired with an ordinary respiration were not studied. The limit of the concentrations was obtained by taking a sample while the breath was held following a normal inspiration, when carbon dioxide dropped as low as 1 per cent. Thus, in spite of the entrance of oxygen with fresh air in each respiratory movement, real fresh air was never breathed through the mask. There was probably some accumulation of carbon dioxide in the blood, but this was not considered dangerous. Oxygen in the mask was evidently never reduced so far as not to support combustion.

To determine the effect of a mask on the ability to do muscular work, a subject was placed in a sort of rowing machine where he did 234 kg.-m. of work in a three-minute period. When breathing through a mask it became difficult to hold to this pace, due partly to the accumulation in the mask of moisture from perspiration and breath. This difficulty was reduced when breathing through a glass tube direct to the exterior, but still wearing the mask.

The French and English masks are discussed. The French is considered little better, for its valves for intake and outlet do not separate the air at the mouth, moisture can accumulate, and carbon dioxide accumulates as in the German form. The English mask separates the two streams of air and keeps the inside dry, but in the four absorbers tested the valves preventing expiration through the absorber leaked so that even this form increased the dead space of the body, although the extent of this leak is not estimated. Other criticisms on the masks are mentioned. The separation of the two currents of air at the mouth and the exclusion of respired air from the interior of the mask are considered as desirable features in a mask. — E. L. Sevringhaus.

Industrial Fatigue. *A. F. Stanley Kent.* Jour. State Med., Sept., 1920, 28, No. 9, 261–273. — The term "industrial fatigue" has come to mean the condition of inefficiency found in industrial workers, whether due principally to the performance of mechanical work or not. It sometimes happens that symptoms similar to those of fatigue appear in an individual, or in a group of individuals, under circumstances where the task performed seems inadequate to explain them. The theory of fatigue which best explains these cases is that it is due in part to the using up of energy-producing material in muscle and nerve, and to a greater extent to a temporary poisoning of the muscles and especially of the nerves. We must recognize the fact that these fatigue-producing products may be formed in ways not connected with the output of energy — for example, by

processes occurring in the digestive tract. Other factors in fatigue are poor ventilation and noise. Vibration is another factor, important in the case of locomotive drivers, boiler makers, etc.

In many investigations of industrial conditions it is necessary to be able to estimate the effect of various factors — of work and of the surroundings of the worker — in terms of fatigue. The test of output fails, since output depends upon other variables besides fatigue, and may vary either with or against fatigue. Output is, however, affected by fatigue, and, where readings are taken over a sufficient length of time and from a sufficiently large number of persons, valuable indications may be obtained. The examination of sickness returns is important, for well-kept sickness returns form a valuable index of the general state of health of employees. Fatigue causes diminished resistance to disease, and this shows itself in the sickness returns. Records of lost time, and numbers of persons late are valuable indications. Accidents, also, are an index of the grade of fatigue present in the worker.

An analysis of records kept with reference to the output, etc., during two periods in an elastic webbing factory, leads to interesting results. During one period the working hours were $56\frac{3}{4}$ per week; during the other, $50\frac{3}{4}$. More persons were absent, and more time was lost when hours were long than when they were shortened. There were also, in the former period, wider variations as regards the number of persons late and loss of time on different days of the week, showing an unstable condition of the workers during the period of longer hours. The curve for the first period showed for Saturday a great increase in lateness and lost time. Whatever the cause, irregularity on Saturday ceased as soon as hours were shortened. But the records for Mondays, after the change, show relatively (as compared with other days of the week) more loss of time and lateness than before — a condition which, in the opinion of the writer, needs careful investigation, since it is evidently due to other factors than fatigue. The diminution of six hours a week, in the case considered, was sufficient to make a difference between "overload" and "not overload." As regards output, the shortened day was actually more productive than the long day. There was also a great decrease in sickness. — G. E. Partridge.

Smoking and Fatigue. *Paul Bartholow.* Editorial. Boston Med. and Surg. Jour., Nov. 18, 1920, 183, No. 21, 606–608. — The relations of smoking to fatigue are discussed in the light of the contradictory evidence emanating from all quarters. The relation of smoking and labor efficiency requires further investigation, and the starting point should be the actual conditions of the worker's life. Whether nicotine raises blood pressure or affects voluntary muscular action are facts, valuable no doubt, but obviously of little use in answering the main question definitely. — Barnett Cohen.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

Protective Measures against Dangerous Contact in Plans for Low Tension Electric Wiring. *W. Vogel.* Electrotech. Ztschr., Sept. 23, 1920, 41, No. 38, 752–753. — The author suggests certain protective measures for low tension wiring of shops and factories. — G. M. Fair.

WOMEN AND CHILDREN IN INDUSTRY

The New Place of Women in Industry. *Ida M. Tarbell.* Indust. Management, Oct., 1920, 60, No. 4, 265–266. — Miss Tarbell calls attention to the unexpected accomplishment of women during the war. They were trained to be good machinists, in some cases were able to perform heavy work without apparent physical injury, proved themselves ingenious in the laboratory, and exhibited executive qualities in positions of managers, superintendents, foremen, and employment supervisors. In view of the contention that immigration will be limited both by a change of standards in this country and by the increased ability of European countries to retain their population, it is maintained that there will arise a greater need for women in industry than prior to the war.

It was feared that with the beginning of the war there would be a serious return to early methods of labor exploitation. This fear, however, seemed ungrounded, particularly in the case of England, France and the United States. The tendency was markedly in the other direction, and this was especially true in the case of women workers; so that standards for the employment of women were greatly benefited by the war. There still remains, however, a task which industry itself can do much in accomplishing in the way of developing higher and better standards for the position of women, who, Miss Tarbell feels convinced, will continue to remain in industry in large numbers. Further improvement of standards will be of value not only in this country, but also in less progressive countries, such as Japan, where our codes may well serve as a basis for improving the condition of women workers. — C. H. Paull.

A Nutrition Class for Working Children in Chicago. *M. J. Roberts* and *Anna Boller*. Mod. Med., Oct., 1920, 2, No. 10, 664–667. — This article is a report of an attempt to meet the common need for the supervision of the physical welfare of growing children. Infant welfare work has already accomplished much in the way of reducing mortality at early ages. The Children's Bureau investigation in 1919 has emphasized an even greater problem in older growing children, especially those who are obliged to work.

Chicago finds its most effective agency in the Vocational Guidance Bureau of the Board of Education which, as one of its functions, serves as a clearing house for all working children who are below a certain standard of physical fitness. The method of this agency consists in first making each child aware of his physical defects as well as of errors of diet and habits; and then helping him to help himself.

In a class conducted as part of the Industrial Clinic at the Rush Medical School, 133 children, all sent by the Vocational Guidance Bureau, made 951 visits during the first eight months of the clinic. The proceedings of each session comprised instruction in the elements of diet, sleep, clothing, physical training and other matters of general hygiene. As a preparation for effective instruction a supper of substantial food was found a practical necessity. Corrective measures included some of the more simple forms of surgical treatment such as that of tonsils or teeth, as well as exercises for general development.

Records of six children, all workers selected from this class, are reported with diagrams showing weight changes. The charts cover periods varying from twelve to thirty-four weeks. In most instances the underweight percentage is decreased by at least one-half during the period of attendance. — H. W. Stevens.

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This is a subject index to all the reading matter in the ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE and one should, therefore, look for the subject word. The name of the author follows the subject entry in parentheses.

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